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Improved Station Design Shown at South Meadows

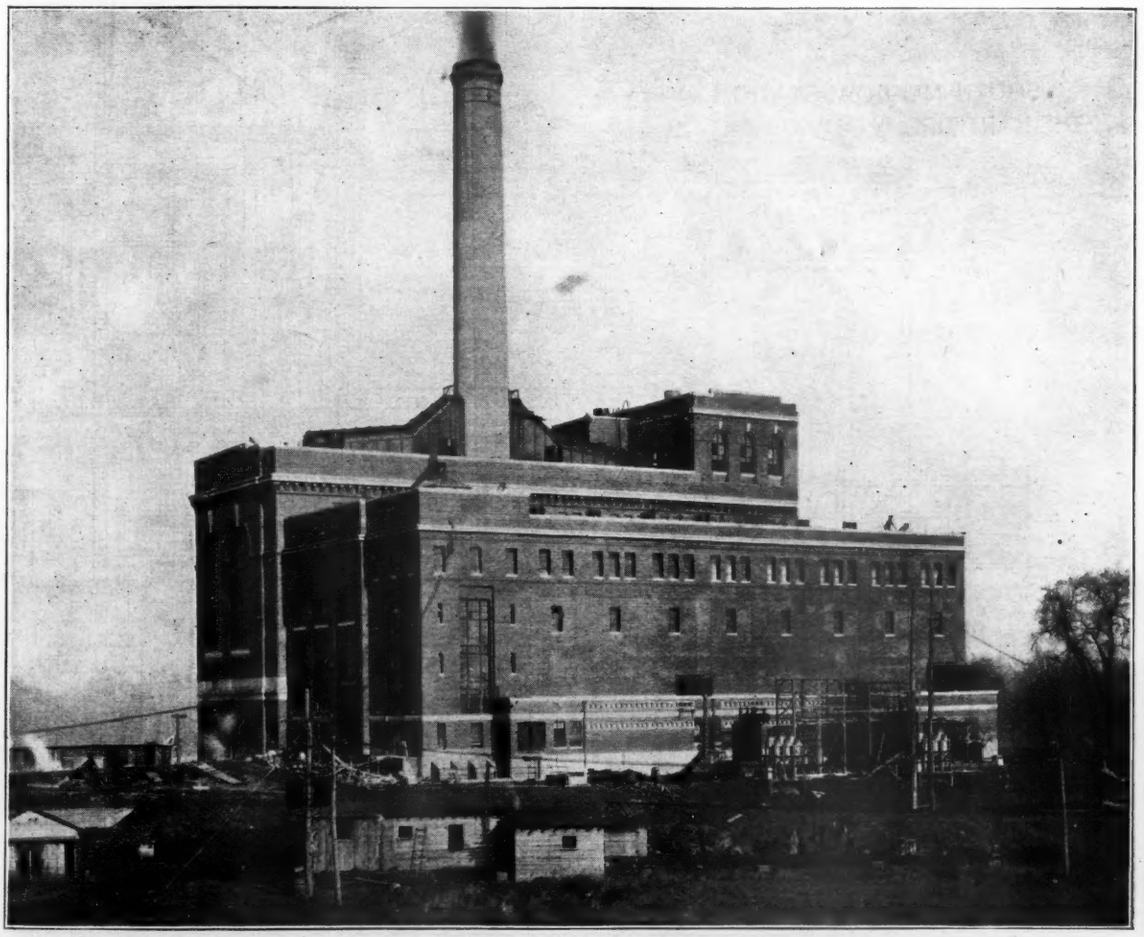
Closed Generator Cooling System Adopted to Eliminate Hazards of Dirty Air — Plans Contemplate Future Interconnection with Other Large Plants—Boiler Room Controlled by One Operator

By C. H. REEDER

Engineering Editor, Electrical Review.

In the spring of 1919 Stone & Webster, Inc., was instructed to proceed with the preliminary work in the design of the South Meadows station of the Hartford (Conn.) Electric Light Co. The Hartford Electric Light Co. furnishes light and power to the homes and industries in the city of Hartford and immediately adjacent towns, and through a high-tension line connection with the Connecticut Power Co. exchanges power with that company's system. It has been a pioneer in the power and lighting business for many years, having been the first public service company to install a steam turbine for the generation of power and being in the forefront in many other branches of the industry.

The property on which the new plant is being

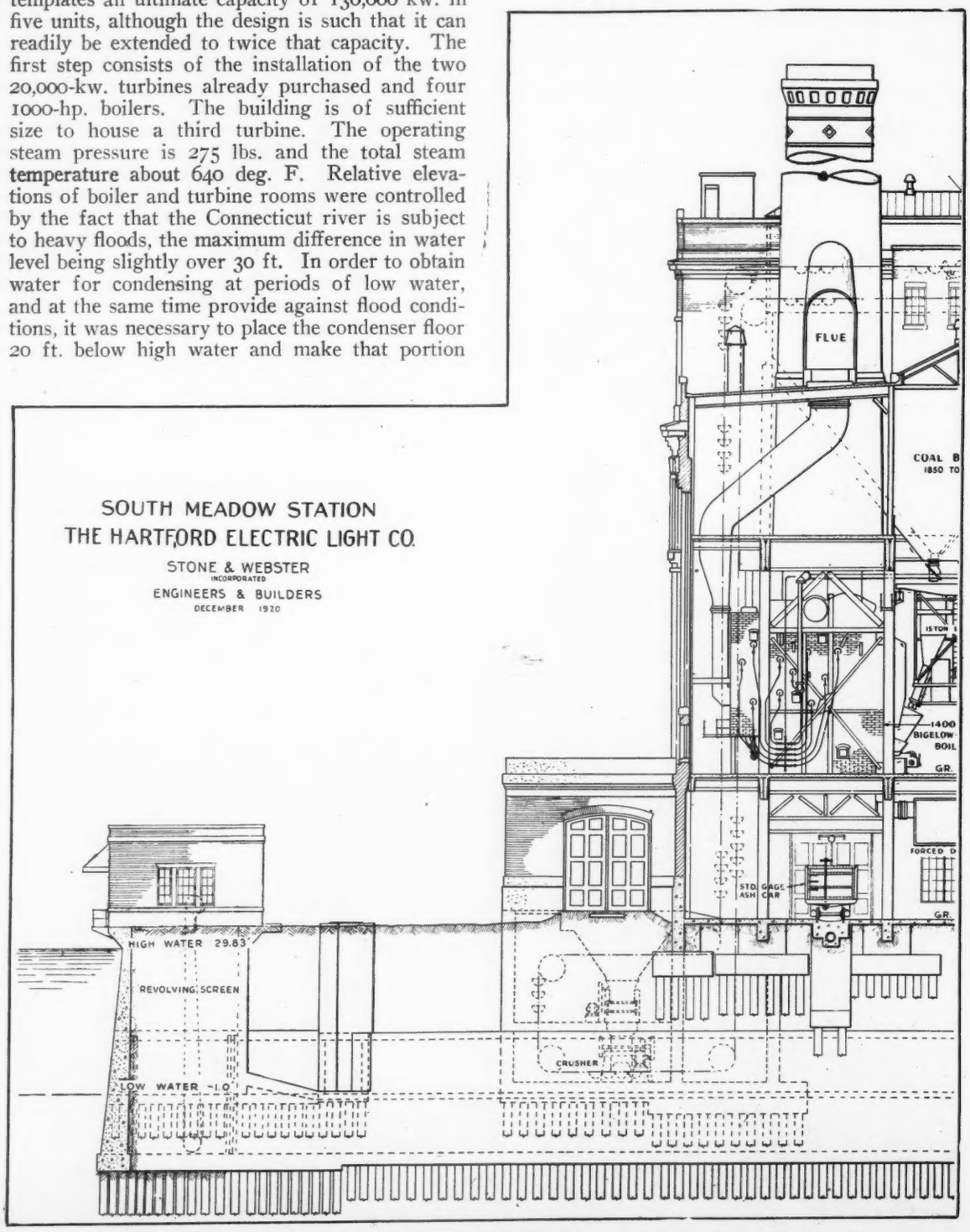


General View of South Meadows Station of The Hartford Electric Light Co.

built is located on the Connecticut river about a mile below the Dutch Point station. It comprises a tract of over 50 acres admirably adapted for the development of a large steam power station, with ample space for cool storage and for any outside switching and transformer equipment that may be required for the distribution of large amounts of power at high voltage. The first 20,000-kw. unit with its condenser equipment was purchased at the time the preliminary plants were started, and the second unit was ordered several months later. The first unit is now in operation.

The layout of the station as decided upon contemplates an ultimate capacity of 130,000 kw. in five units, although the design is such that it can readily be extended to twice that capacity. The first step consists of the installation of the two 20,000-kw. turbines already purchased and four 1000-hp. boilers. The building is of sufficient size to house a third turbine. The operating steam pressure is 275 lbs. and the total steam temperature about 640 deg. F. Relative elevations of boiler and turbine rooms were controlled by the fact that the Connecticut river is subject to heavy floods, the maximum difference in water level being slightly over 30 ft. In order to obtain water for condensing at periods of low water, and at the same time provide against flood conditions, it was necessary to place the condenser floor 20 ft. below high water and make that portion of the turbine room below high water a watertight concrete box. This required special provision against flotation and careful execution of the design to insure a tight job. The ash-room floor is at the level of the outside grade and above high water.

In design and general arrangement the turbine room is rather interesting. The only pieces of operating equipment at the turbine-room floor level are the turbines themselves, all the auxiliary equipment being at the condenser floor grade 25 ft. below. The turbines are placed with their axes in one line and in the center of the turbine



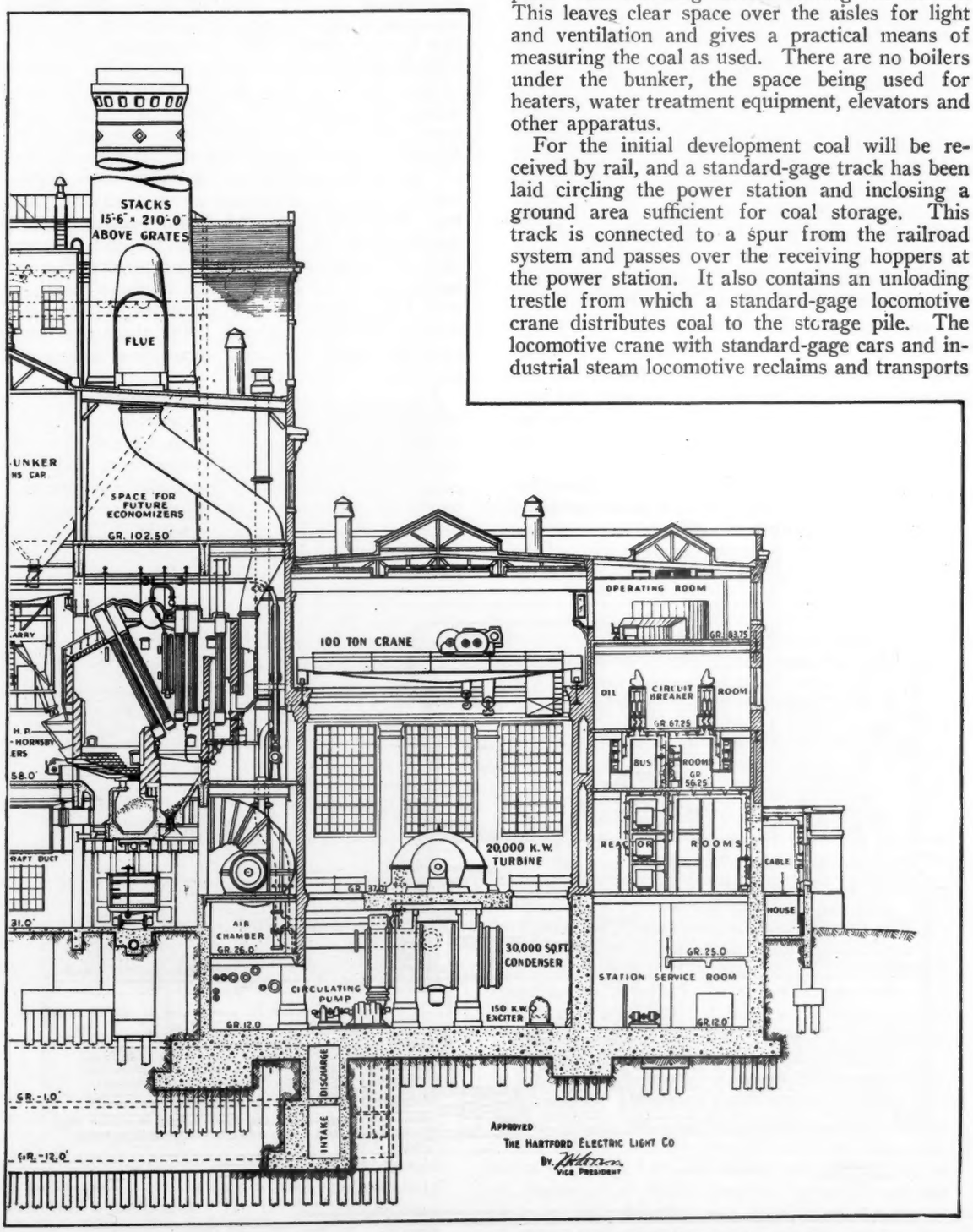
Cross Section Through South Meadows Station, Showing Water Front and Coaling Equipment.

room, the turbine room floor being in reality only a platform about 4 ft. wide along each side of the units and about 15 ft. wide between the ends of the units. This fills all the conditions necessary for the proper operation of the units and allows an abundance of light to reach the condenser floor where most of the operating equipment is located. The auxiliary equipment is all located on the boiler room side of the units, leaving the side next the electrical bay free of all equipment. This greatly simplifies the piping and assists in the dismantling of machines. All auxiliaries and equipment have been carefully located, with the result that the plant gives the appearance of its extreme simplicity and is easy of operation and maintenance.

General Arrangement of the Steam-Generating Equipment.

The boilers are arranged in a double row with the firing aisle parallel with the turbine room. A total of 16 boilers of approximately 1400-hp. capacity are contemplated for the ultimate station, four of which are now installed. A central bunker scheme has been used, the bunkers being placed overhead and in the center of the ultimate plant with traveling larries serving the boilers. This leaves clear space over the aisles for light and ventilation and gives a practical means of measuring the coal as used. There are no boilers under the bunker, the space being used for heaters, water treatment equipment, elevators and other apparatus.

For the initial development coal will be received by rail, and a standard-gage track has been laid circling the power station and inclosing a ground area sufficient for coal storage. This track is connected to a spur from the railroad system and passes over the receiving hoppers at the power station. It also contains an unloading trestle from which a standard-gage locomotive crane distributes coal to the storage pile. The locomotive crane with standard-gage cars and industrial steam locomotive reclaims and transports



Cross Section Through South Meadows Station, Showing Turbine Room and Control Equipment.

the coal to the receiving track hoppers. Considerable money was saved by utilizing this layout for construction purposes and reducing the cost of temporary trackage.

Future conditions might make it desirable to receive coal by barge, in which case there is ample room to install a tower and unloading equipment. When the coal is received at the station from either storage or railroad it is dumped into track hoppers covered by a low house. There will be two hoppers, each of 140 tons per hr. capacity, in the ultimate design accommodating four cars at a time. Underneath each hopper is an apron conveyor, 60 ins. wide, which receives the coal from the hoppers and conveys it to two 36 by 48-in. double-roll crushers of 130 tons per hr. capacity each—chutes and bypasses allow either conveyor to discharge to either crusher.

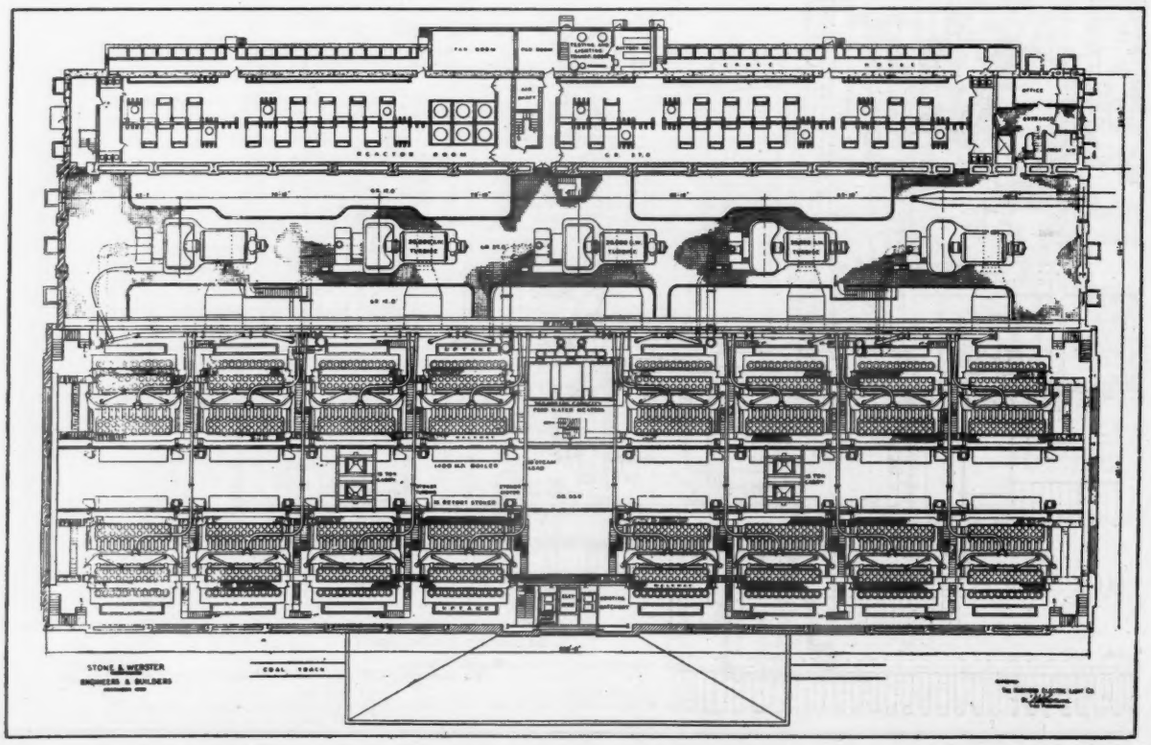
From the crushers the coal passes to two pivoted bucket elevator conveyors, and chutes and bypasses allow either crusher to discharge to either elevator. The elevator conveyors carry the coal from the crushers and deliver it to the central bunker. All drives are by induction motors, the controls of which are interlocked so that starting and stopping the various apparatus can only be done in the proper sequence. Only one hopper, feeder, crusher and elevator are included with the first installation.

Ashes are dumped from the stoker into brick-lined concrete hoppers of capacity for 24 hrs. accumulation. In the bottom of each hopper are four air-operated ash gates through which the ashes are dumped into standard-gage railroad cars for removal.

The four 1400-hp. boilers in the present installation are of the water-tube type as made by the Bigelow-Hornsby Co., and each one has an integral economizer of approximately 20% of the boiler heating surface. The economizer sections are placed in the rear part of the boiler settings, and each boiler has a superheater containing 2750 sq. ft., designed to give 225 deg. F. superheat at 200% rating. The stokers are of the Riley underfeed multi-retort, extra-long type with the usual Riley continuous dump plates. Each stoker has retorts with 286 sq. ft. of area, the furnace volume being 6370 cu. ft. or 22.2 cu. ft. per sq. ft. of grate surface.

The boiler and combustion control equipment has been placed in a room designed for the purpose and located in the center of the ultimate plant. In it are master steam-pressure controllers actuated by the steam pressure in the main header and controlling the regulating valves in the steam line to each forced draft fan turbine. The controllers also operate the regulating valves on each stoker turbine. The uptake dampers for each boiler are operated by "balanced" draft regulators, maintaining a slight minus pressure in the furnace. On a gage board in this control room are the major portion of the boiler room instruments, such as indicating steam pressure gage, and recording gages for steam pressure, steam temperatures, boiler feed pressure and temperature, draft pressure, steam flow meters, flue gas temperature and CO_2. There is also a totalizing watt-hour meter for total plant output. In addition to the above, at each boiler there are steam pressure gages, indicating steam flow meters and three-in-one draft gages.

The intent of the above arrangement of equipment and instruments is to enable one highly skilled boiler-room operator to have the output and efficiency of the entire boiler room under his observation and control. Normally the operation would be automatic, but if conditions make it desirable the boilers can be controlled manually. It is not intended that this arrangement will give perfect combustion at all times, but it should en-



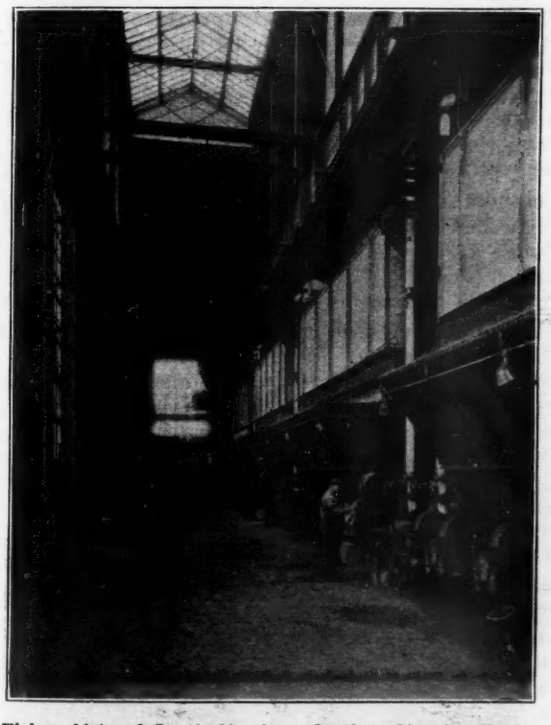
Plan of South Meadows Station, Showing Boiler Room, Turbine Platform and Other Features.

able one competent man to control the boiler room and not have to depend on the divided responsibility and lack of co-operation from several boiler operators scattered at different points down the room.

Both 20,000-kw. turbogenerators in the immediate installation are of General Electric make with a water rate at the best loading point of 10.1 lbs. They are supported on reinforced concrete foundations of considerable mass and insulated from the building structure. Each generator has a direct-connected exciter, and in addition there is at present one steam-driver exciter.

Under each turbine there is a 30,000-sq. ft. Westinghouse surface condenser bolted direct to the turbine exhaust nozzle and supported on springs. The condenser auxiliaries are in duplicate as follows: Two 18,000-g.p.m. circulating water pumps with bottom suction and motor-operated valves on the discharge, one driven through gears by a steam turbine and the other direct-connected to an induction motor; two 2-stage double-suction horizontally split casing condensate pumps, one direct-connected to a steam turbine and the other to an induction motor; one LeBlanc hydraulic air pump driven through gears by a steam turbine, and one 2-jet single-stage air exhauster discharging into a small surface condenser supplied with condensate or service water.

Choice of auxiliaries in service is governed by



Firing Aisle of South Meadows Station, Showing Stoker Equipment.

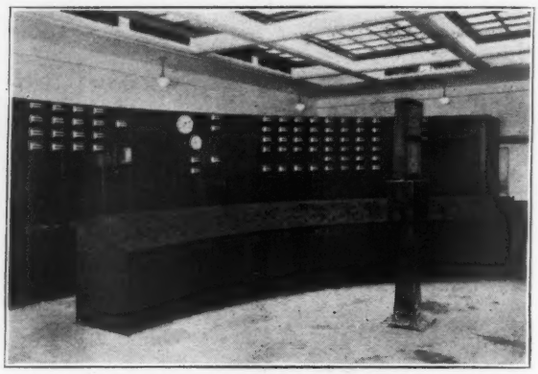
operating conditions and heat balance requirements, the intent being to maintain the temperature of the feed water between 180 and 212 deg. F. In case operating conditions at light loads should occasion a choice of auxiliaries that would give some excess steam this would automatically be bled into a main unit. The proper temperature for boiler feed was taken as 180 deg. F., having in mind loss of efficiency through economizer

Turbine Room with Opening Down to Condenser Floor.

sections of boilers if it went higher, and possible corrosion troubles in economizers due to air in feed water if it went much lower. The choice of auxiliaries and provision for heat balance at this plant was largely governed by the fact that one 20,000-kw. unit was to be installed as the first step, another 20,000-kw. unit a year later, and the balance as load conditions require.

Closed Cooling System Adopted for the Generating Units.

An interesting feature of this installation is the closed system of generator air cooling. For each 20,000-kw. unit 55,000 cu. ft. of air per min. is required for generator cooling. This is continuously recirculated in a closed chamber and is cooled after each passage through the generator by means of water sprays. The distance between the turbine sub-base and the condenser floor is 25 ft. There was, therefore, ample space for the entire equipment under the generator end of the turbine foundation. The inclosure is built of brick and concrete to eliminate noise, and the arrangement provides for two sets of sprays—one in the uptake to each end of the generator. This arrangement gives liberal space with consequently low air velocity and also permits using an arrangement of dampers whereby air can if occasion requires be drawn from the turbine room and discharged back into the room or into the suction chamber of the forced draft fans. This arrangement permits the using of generator air to assist in heating the turbine room and reduce roof condensation by throwing down excess moisture as the air passes through the sprays. (In addition to this there will be introduced into the room about 20,000 c.f.m. of heated outside air so as to maintain a slight positive pressure in the room.) The dampers are interlocked by means of gears and operated by an electric motor for quick change from closed system to open system



Main Station Control Board and Generator Pedestal in South Meadows Station.

in case of loss of water pressure. River water supplied by a motor-driven pump is normally used for cooling. An emergency service water connection is also provided, arranged to come into operation on loss of water pressure.

The feed-water heaters, tanks and pumps are under the coal bunker and centrally located as regards the ultimate development. The present installation consists of a storage tank of 20,000-gals. capacity on the roof, a 5000-gal. surge tank under the coal bunker, two 12,000-hp. Cochrane open feed-water heaters, and two 1000-g.p.m., and one 500-g.p.m. feed pumps. In addition there are two 250-g.p.m. sand pressure filters for filtering all the river water used for power service.

General station connections have been laid out with the idea of securing an arrangement which is simple, safe and easy to operate, and at the same time lends itself readily to future extensions or changes which may be brought about through developments in electrical equipment, either in the form of generating, switching or transmitting apparatus. While at present the distribution will be largely at 11,000 volts in the future energy may be distributed largely at 66,000, or at some higher voltage, and the station may be connected to other large power generation or transmission systems.

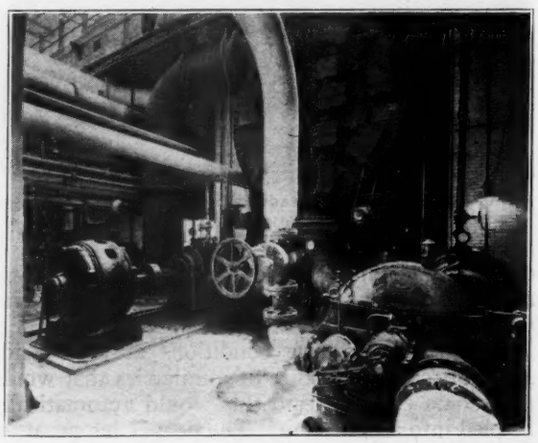
There will be two 11,000-volt, 3-phase buses on either of which all 11,000-volt circuits may be paralleled, selector oil circuit-breakers being provided in each circuit. Since only one generating unit is now installed the installation and equipment of the second bus has been postponed. Provision is made for protective reactors in each of the 11,000-volt circuits, although for the present such reactors are installed only in the tie lines connected to the Dutch Point generating station. The reactors in these tie lines are designed to give a voltage drop of 15%, based on the normal current rating of the circuit. The reactors in all other 11,000-volt power feeders will give a drop of 3%, based on the rated capacity of the circuit. Provision is also made so that if necessary reactors can be placed in the main generator lines. All 11,000-volt feeder circuits leave the station underground and, consequently, no provision is made for connecting lightning arresters to them, although an oxide film static discharger is provided for each 11,000-volt bus.

Each generator has a direct-connected 250-volt exciter large enough to serve one generator only, a separate steam-turbine-driven exciter being provided as a relay, with capacity sufficient to excite the largest unit which will be installed in the station. Provision is also made for the future installation of a duplicate steam-driven exciter. Normally there will be no parallel operation of exciter units, but exciter connections may be transferred without interrupting excitation service. The neutral of each generator is connected through an oil circuit-breaker to the neutral bus which in turn is connected to ground through a resistance of 5 ohms having a carrying capacity of 1300 amperes for 1 min. Provision is made for short-circuiting this resistance in case it is necessary to furnish more current in burning out a grounded cable. Normally only one generating unit will be connected to the ground bus.

The station is designed so that it may be used to feed a high-voltage network covering a considerable territory, and space has been reserved directly to the west of the building for outdoor transforming and switching equipment which such service may demand. At present only two 7500-kv-a., 3-phase, self-cooled transformers will be installed, stepping up from 11,000-volt delta to 66,000-volt *Y*, the neutral of each transformer being permanently grounded to the tank. These units are so designed that, by installing a cooling system, they may be rated at 12,000 kv-a. each, continuously.

A track has been laid out to serve both the 66,000-volt and the station-power transformers, and a suitable truck has been provided so that any of these units may be carried into the main turbine room where they may be dismantled under the crane if repairs are necessary. The 66,000-volt switching and protective equipment is of the usual outdoor type.

The switchboard for the control of 11,000-volt circuits is located on the top floor of the electrical bay and consists of a double vertical panelboard with a separate control bench, all of black oil-finished slate, the vertical panel and bench sections being assembled on a curve. At the present time only one-half of the ultimate panel equipment is installed. The front vertical panels contain the circuit-operating instruments and relays, and the rear panels contain the watt-hour meters and curve-drawing instruments. The bench contains all control switches, together with a mimic bus showing the main circuit connections.



Condenser and Circulating Pump in South Meadows Station.

Stability of Conducting Furnace Hearth Structures

Relining of Properly Designed Hearth Not Required After Four Years of Continuous Operation—Great Strides Have Been Made in Manufacture and Operation of Furnaces in Recent Years

By FRANK HODSON

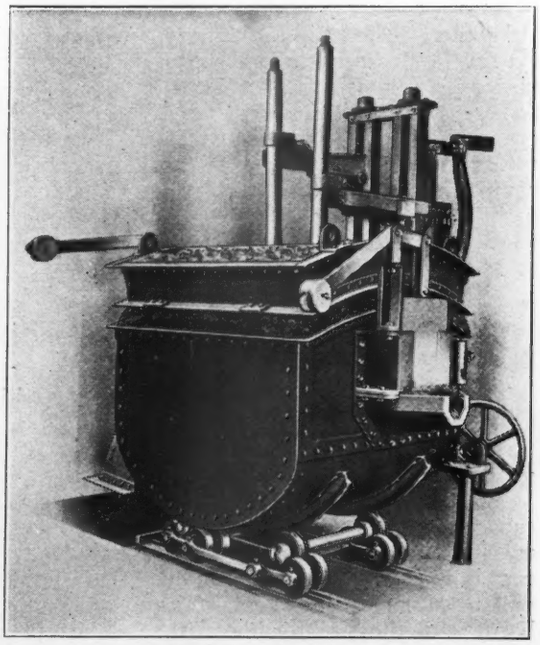
President, Electric Furnace Construction Co., Philadelphia, Pa.

The increasing interest being shown in the use of electric furnaces for melting iron borings and cheap scrap, and also in the use of large-capacity electric furnaces for refining hot metal, brings to the fore the advisability of considering the many advantages of furnaces having a properly designed and proven bottom connection. It has been said that these conductive furnace hearths are not durable. All conductive hearths are classed together whether they have steel, copper or carbon studs protruding through the hearth, or even if they only carry a neutral point and no real power. Undoubtedly the earlier types of conductive hearths with studs projecting well into the lining gave quite a lot of trouble. Trouble was also experienced on the furnaces that ran Scott-connected with two phases only, and where a thin conductive lining was used for a neutral. The modern furnace with bottom connection, of which the Greaves-Etchells may be taken as typical, is entirely different from any of those described above and is not subject to the same fundamental disadvantages.

In the first place, as will be seen from the accompanying illustration, two phases of the 3-phase power supply is taken through top electrodes and the third phase is connected directly to a copper plate lying underneath the lining, giving a definite source of power under the charge. No studs project into the lining, and after putting a few inches of special carbon compound over the copper plate the whole lining is rammed in of standard basic material—dolomite or magnesite, or mixtures of the two with sufficient tar to bind. The lining is purposely made thick and highly resistive at the upper part where it is in contact with the charge. It is here the heat is generated by resistance, not in the copper plate which always is cool enough to touch. In drying out the lining the tar before being burnt out helps to carry the current through and once current has been put through, will continue to carry current. If the lining is kept reasonably free from slag or silicon from the roof the furnaces will start up cold with the bottom functioning normally. In any case, even with a cold furnace only a very few minutes suffice to get bottom connection. When it is obtained the advantages are very pronounced. In addition to the top arcs considerable heat is generated in the charge by its resistance to the flow of current. More heat is generated by the resistance of the surface of the hearth, and this is immediately absorbed by the charge in contact with the lining.

The charge comes down evenly without the mechanical stirring or danger of burning the bottom as when the electrodes of a top connected furnace bore through the scrap. When molten the heat generated under the charge keeps it moving slowly upwards. This slow circulation from the bottom can be seen and has many times been proved. Temperature of metal at different depths in the bath and analysis of alloy steels at different depths prove that slow circulation does exist. In the refining of either iron or steel this circulation not only carries away and usefully absorbs the intense top heat of the arcs, but also brings all parts of the bath into contact with the refining slags. Sulphur or phosphorus refining and deoxidizing are therefore very rapid and thorough. The linings are usually constructed having a depth of solid basic refractory from 20 to 30 ins., depending on the size of the furnace. As the heat generated at the top of the furnace lining is always absorbed as rapidly as made by the charge there is no danger of weakening it. The metal comes out clean—a skull on the furnace hearth is practically unknown. There is no segregation of alloys on the bottom and no thickening up takes place.

Over 70 furnaces with this resistive durable hearth are now in successful operation and as a



View of Furnace, Showing Tilting Arrangement and Other Features.

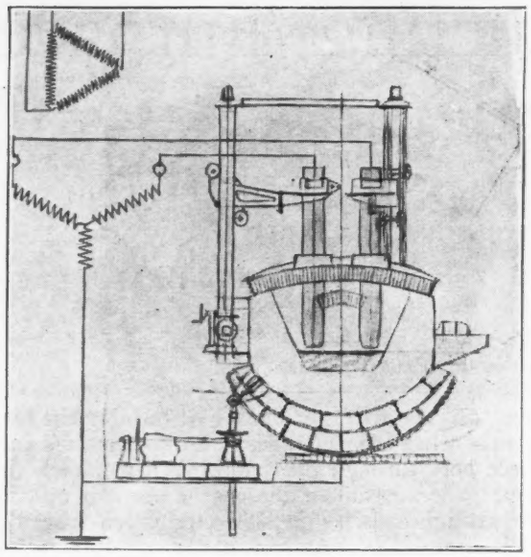


Diagram Showing Arrangement of Furnace Parts and Circuits.

matter of interest it may be said that the accompanying illustration shows a Greaves-Etchells furnace installed in June, 1917, that has worked continuously with the production of thousands of casts and is still in operation on the original hearth. In one of the large works the practice is followed of chipping out about 4 or 5 ins. of the top surface of the hearths once a month and reramming new material in. This is done more as a metallurgical precaution to insure clean steel, but the real linings of these furnaces have not been changed for years. There is no doubt that a hearth of this type, having very distinct metallurgical and electrical advantages, when intelligently installed and maintained is practically permanent.

DES MOINES VOTES TWO TO ONE FOR FRANCHISE.

People of Des Moines, Ia., have apparently had enough of the kind of public transportation furnished by automobiles and motor busses. A few days ago they voted almost two to one for the granting of a new franchise which will permit the return of electric street railway service. The company operating the street railway was forced early in the year to suspend operations because of the unregulated competition of automobiles and busses in the carrying of passengers.

WILL CONSTRUCT HYDROELECTRIC PLANTS IN INDIANA.

The Indiana Hydro-Electric Power Co., Indianapolis, recently organized, is perfecting plans for the construction of a series of hydroelectric generating plants on the Tippecanoe river in White county. The initial plant will have a capacity of over 26,000 kw. and will be located at Norway, near Monticello; it is estimated to cost in excess of $1,000,000. The other stations will be situated at Oakdale, Tioga and Springboro, with the site for the fifth and last plant now projected, still to be selected. The company will operate with a capital of $5,000,000, and application has been made to the Public Service Commission for permission to issue bonds in an amount of $1,250,000, and stock for a like sum. Samuel Insull, president of the Middle West Utilities Co., 72 West Adams street, Chicago, heads the new company; Harry Reid, president of the Interstate Public Service Co., Indianapolis, will act as vice-president and manager.

FIGURES ON CONSTRUCTION WORK SHOW INCREASE.

New construction throughout the country in the first 10 mo. this year nearly equals construction of the whole of last year, according to a recent survey made by the Chamber of Commerce of the United States. The Chamber's conclusions are based on figures from 44 important cities reporting $603,000,000 in new construction in the 10 mo. The estimated cost of all construction, including alterations, in the 44 cities in the 10 mo. was placed by the Chamber at $722,000,000, divided as follows: Residential, $349,000,000; nonresidential, $254,000,000, and alterations and special construction, $119,000,000.

NEW YORK COMPANIES' SECTION, N. E. L. A., ISSUES BULLETIN.

The first issue of the *Bulletin* of the New York Companies' Section of the National Electric Light Association to be published since the war made its appearance recently. According to Romeyn P. Benjamin, the editor of the publication, every issue is to contain one signed article by an expert on some phase of the central station industry, or on particularly interesting activities of the association.

The *Bulletin* for November includes an article by T. G. Spates, assistant to the president of The New York and Queens Electric Light & Power Co., and chairman of the newly reorganized New York Companies' Section of the National Electric Light Association, outlining the history of the section from its beginning up to the present time.

NEW YORK ELECTRICAL LEAGUE TO ELECT OFFICERS.

The members and guests of the New York Electrical League were treated by Raymond L. Ditmars, curator, New York Zoological Park, to an interesting talk, accompanied by motion pictures, on "Reptiles" at the Thanksgiving luncheon held at the Hotel Astor, New York City, Wednesday, Nov. 23. The Christmas luncheon of the league will take place at the same hotel on Dec. 21 and in addition to novel and entertaining features, the officers and directors for the year 1922 will be elected at this meeting.

Orders for the purchase of 127 steel passenger coaches, all of the latest design and with all modern conveniences embodied, have been placed by the Chicago, Burlington and Quincy railroad, according to announcement dated Nov. 29. The road's statement said the cars were ordered in anticipation of increased business during the coming summer. The orders include 12 dining cars, five chair cars, 54 coaches, 12 baggage, 22 mail, and 22 miscellaneous cars.

Demonstration of an Automatic Coal-Mine Substation

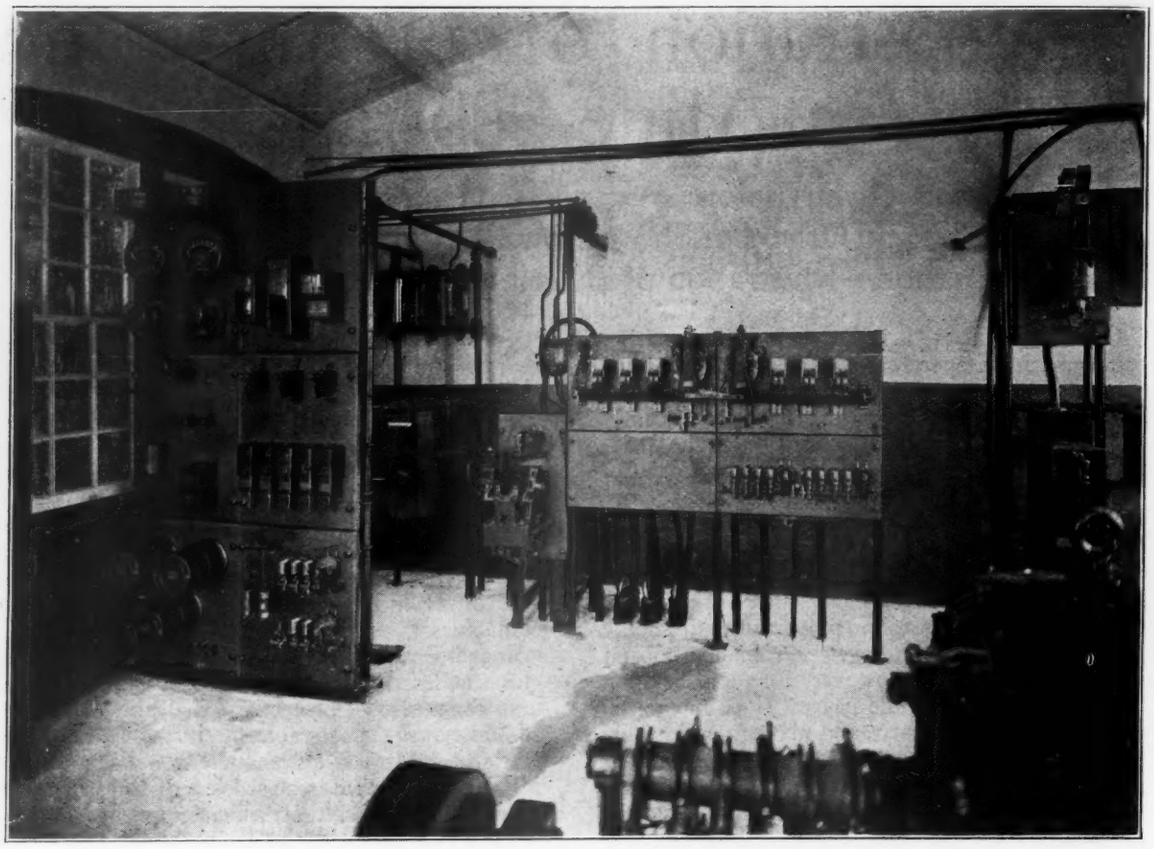
Exhibition Given Before Party of Consulting Engineers, Mine Operators and Others to Show How Equipment Handles Operating Situation—Illustration of Exterior of Station and Equipment

On Dec. 7, 1921, a large party of consulting engineers, mine operators, etc., were given an interesting demonstration of the operation characteristics of a semi-automatic substation recently installed by the General Electric Co., at the Drifton, Pa., colliery of the Lehigh Valley Coal Co. This substation consists of one 200-kw., 250-volt, d-c. synchronous converter, with the necessary a-c. and d-c. control apparatus, used for supplying power to the mining load of that colliery. The workings of the colliery cover such an extensive territory that it was found impractical to supply them all with 250-volt service from one substation. It was found, however, that a substation located 3000 ft. from the nearest slope having an engineer on 24-hr. duty, and about a mile from the circuit-breaker, would supply 250-volt service satisfactorily without extremely large feeder capacity. To save the wages of a station attendant and at the same time secure uniform starting it was decided to make the station semi-automatic, it being controlled from a pilot switch located in the slope engine house.

Power at 11,000 volts from a 3-phase, 60-cycle circuit is received at an outdoor substation located near the slope, where it is stepped down by three 333-kv-a. transformers to 4600 volts. The 4600-volt line is tapped at the substation through a pole-top disconnecting switch, lightning arrester, choke coil and fuse. From the fuse the circuit runs in conduit to an incoming oil circuit-breaker operated by a magnetic contactor. From here the line goes to transformers located just outside the building, the low-tension leads of which run to the converter through the starting and running contactors.

Inasmuch as the substation is unique in its class, a description of its sequence of operation and the various protective devices employed, should be of considerable interest. To start the station a control switch mounted on a small panel in the engine room is closed, energizing a voltage relay in the substation which closes if the a-c. voltage is high enough to insure proper operation. The closing of the relay contacts energizes a main control contactor which, provided all the protective devices are in proper position, closes, starting up the motor-driven controller. If the d-c. brushes

Interior View of Drifton (Pa.) Automatic Substation, Showing Converter and Arrangement of Equipment.



Interior View of Drifton (Pa.) Automatic Substation, Showing Control and Operating Board.

are not raised the circuit is first completed through a brush-raising motor which raises the brushes and also stops the completion of the circuit to the controller driving motor. When everything is set and power is applied to this motor it starts closing first the incoming line contactor and then the converter starting contactor. The converter then starts and comes up to synchronous speed. As it comes up to speed the converter field is flashed across the terminals of a small d-c. generator which is driven by the motor of the drum controller. This is done to make sure that the converter builds up with the correct polarity. After being flashed the main field contactor closes, supplying the converter, which should by this time be up to speed, with a definite field. If the set is not up to speed the controller stops revolving until at synchronous speed a centrifugal switch on the converter shaft closes and restarts the controller motor. The controller then opens the starting contactor control circuit and closes the running contactor, which puts full voltage on the a-c. terminals of the machine.

The d-c. side of the converter is controlled by a generator-type automatic reclosing circuit-breaker, the two d-c. feeders being served by similar apparatus of the independent feeder type. After normal d-c. voltage of correct polarity is applied to the converter leads a polarity relay closes, energizing the operating coil of the generator circuit-breaker. After a predetermined interval from the closing of the circuit-breaker the feeder circuit-breakers close, provided the d-c. line is clear.

To stop the set the control switch at the engine house is opened, which causes the voltage relay to drop out, de-energizing the main control and running contactors. It also starts the motor-driven drum controller again, which trips out the incoming oil circuit-breaker and starts the brush-raising motor. When the brushes are raised both the brush-raising motor and the drum-controller motor stop, leaving all the devices in this off position ready to again start the set when the main control switch is closed.

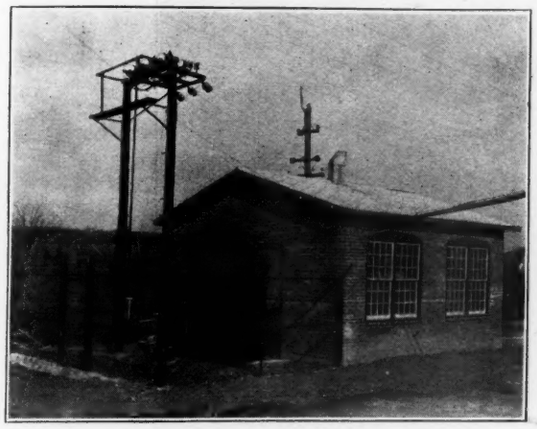
Special Precautions Taken to Guard Against Peculiar Conditions.

In addition to the devices which insure proper sequence in starting the converter, and putting it on the line, it is protected by others from damage that may occur from abnormal conditions that arise while it is running. Among these are excessive time in starting, single-phase starting, flashover on the a-c. end, and overheating of the windings or bearings. Excessive starting time is prevented by a dashpot-timing, hand-reset relay which is held up until the starting contactor closes, when it is de-energized and starts to settle down. If it gets all the way down before the running contactor closes it energizes a lockout relay which trips out the main control contactor. The closing of the running contactor, however, if in time, picks the timing relay up again.

Single-phase starting is guarded against by a potential relay across one phase and a voltage relay across the other, which hold the main control contactor open until 3-phase power is supplied. If single phase occurs while the converter is running it will continue to supply power unless the load current is high enough to cause overheating of the windings. In such case one of the tem-

perature relays will open the main contactor circuit, stopping the machine which will be held out as in single-phase starting.

In case a-c. flashover occurs it energizes one of three current relays which actuate a notching



Drifton (Pa.) Substation, Showing Outdoor Transformers and Switching Equipment.

relay. The latter opens the main control contactor, causing a new start to be made. If the flashover persists for any cause the notching relay operates again for three successive times, and on the third operation actuates a lockout relay causing a permanent shutdown until reset by hand. Overheated windings operate temperature relays which open the main control contactor allowing a restart when they cool down.

If the bearings become overheated bearing thermostats mounted in the pedestal shut the machine down and overspeeding is prevented by a centrifugal trip switch on the converter shaft. Both of these devices must be reset manually. Short-circuits in the station wiring actuate induction relays which trip the main oil circuit-breaker which, if it opens while the machine is running, sets the lockout relay and shuts the outfit down.

BOOK REVIEWS

American Society For Testing Materials Tentative Standards, by the Society. Published annually; 518 pp. with 127 Tentative Standards. Price, $5 in paper and $6 in cloth binding. For sale by the American Society for Testing Materials, 1315 Spruce street, Philadelphia.

By way of explanation the term "Tentative Standard" as distinguished from "Standard" is applied to a proposed standard that is printed for one or more years, with a view of eliciting criticism, of which the committee concerned will take due cognizance before recommending final action toward the adoption of such tentative standards by formal action of the Society. The Standards and Tentative Standards of the American Society for Testing Materials are recognized as authoritative in the field of engineering materials.

This volume of 518 pages of Tentative Standards devotes 12 pages to steel, wrought and cast-iron; 10 to nonferrous metals; 25 to cement, lime, gypsum and clay products; 12 to preservative coatings; 12 to petroleum products and lubricants; 28 to road materials; two to coal and coke; four to waterproofing; four to insulating materials; four to shipping containers; 10 to rubber products; three to textile materials and three to miscellaneous subjects. Any one interested in engineering materials will find this volume very useful.

History of the Telephone and Telegraph in Colombia, S. A., 1865-1921. This is the second of a series—the first being on the Argentine Republic—on the South American countries being prepared by Dr. Victor M. Berthold, foreign statistician, American Telephone & Telegraph Co., New York City.

The subjects of state telegraph, cable service, wireless telegraph, telegraph rates, state and private telephones and a summary of the telegraph and telephone statistics are treated in a concise and comprehensive manner in this book, and the information chronologically presented so that the material is invaluable as a reference work. The writer has evidently performed much research work, sifted out the authentic facts from the unreliable and through patience and perseverance successfully overcome the Latin-American tendency to reply "manana" to requests for official assistance and special information. The thoroughness with which the subject has been handled and the brevity to which the information has been condensed, makes the brochure of full value for its purpose.

SHORT TERM FRANCHISES HAMPER DEVELOPMENT.

Hydroelectric plants will not solve the power problems in Oklahoma is the opinion of John W. Shartel, vice-president and general manager of the Oklahoma Railway Co., and president of the Oklahoma Utilities Association, expressed in a recent address before the Oklahoma State Bankers' Association in state convention in Oklahoma City. The construction of big steam power plants operated by coal will solve the problem, Mr. Shartel declared. He asserted that the present provisions of the Oklahoma constitution restricting the life of public utility franchise to 25 yrs., makes it impossible to build large power plants, as no one can be induced to invest large sums of money in such enterprises under short term franchises.

Restrictions such as these, Mr. Shartel declared, are hampering the progress of the state, depriving communities of cheap power, and of industries that would naturally come to them with the bringing of cheap electrical energy to their doors. "The only way to place public utilities in a position to build plants that can give cheap service," declared Mr. Shartel, "is to grant them indeterminate franchise in connection with proper state regulation of their rates and practices. Huge electrical power plants that would carry electrical energy over hundreds of miles of high-powered transmission lines, would then be built, and they would be able to give the best of service at half the present cost to the people." Mr. Shartel stated that service is being given as cheaply as possible under present conditions, but that small plants can not produce electricity as cheaply as can the large central stations which have been built to last for years.

GEORGE H. SHANK.

Mr. Shank came to Chicago in 1902 and organized the Shank Co., with offices in the Stock Exchange. He had been located in Omaha, Neb., from 1883 to the above year, carrying on a general contracting business and many of the structures built in Omaha at that period were his work. He also built street and steam railroads, sewer systems and much street paving. The first reinforced concrete building in Chicago, the Kenwood Hotel, was built by his company. Innumerable structures in Chicago, including both factory and office buildings, are included in the vast amount of work done by the Shank Co. The old Speedway was its work and the new Hines Memorial Hospital, owned by the government, formerly known as the Speedway Hospital, costing about $8,000,000, has just been completed by his company. The building is of reinforced concrete with brick facing; contains nearly 600,000 square feet of floor space, and authorities claim it to be the finest and most extensive hospital in the whole world. As a fitting close to his long and successful career, Mr. Shank has closed a contract with the Republic of China, Dr. Sun Yat-sen, President, for $100,000,000 to establish American industries in China.

American Engineers to Play Part in Modernizing China

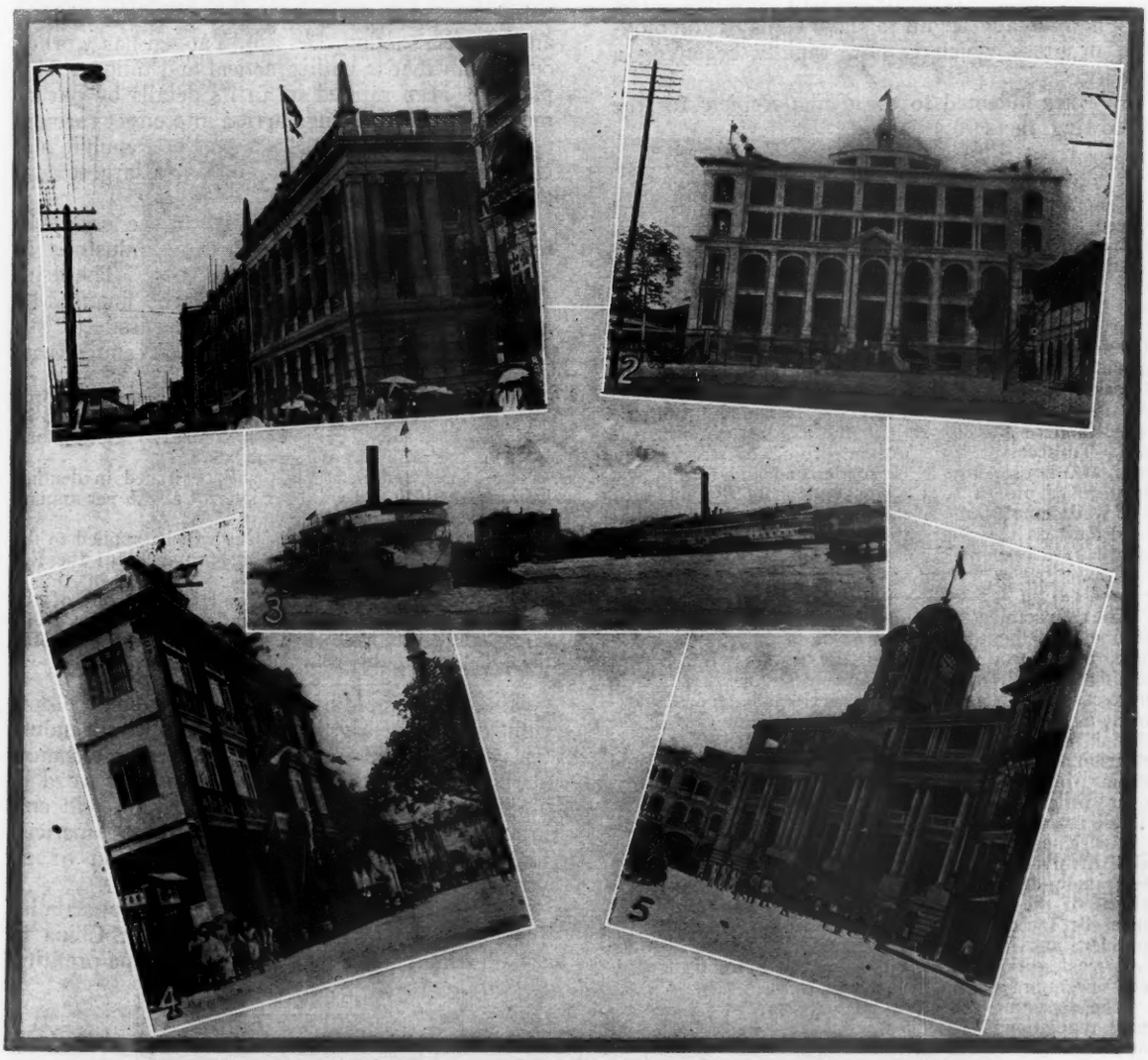
By COL. F. G. BOLLES

There is now an awakening in China that is destined to create from this land of untold natural wealth and resources, a Goliath among the republics of the world.

Blessed with every known mineral, many of them in quantities already known to be vastly greater than have been found elsewhere, China needs only to adopt modern ideas and methods to surpass in wealth and prosperity the countries that have sought to dominate her.

The light which is at last showing her the way to freedom and independence; that will rid her of ages and ages of graft and superstition; that will bring to her very shores the very cream of American invention and industry, modern thought and business management, may wholly be credited to the young and ambitious Chinese, many of whom have been educated in foreign lands and who realize the advantages to be gained by the adoption of Western civilization. Among these men are to be found the real patriots. Their work will be symbolized by monuments to their memory that posterity may know those who blazed the way to greater power.

Standing in the very forefront of these thousands who in the face of stupendous difficulties are fighting the battles for more than 400,000,000 peace-loving souls, is Dr. Sun Yat-sen. The biography of this man reads like fiction. His whole life has religiously been devoted to the



(1) Canton Postoffice, a Modern Building of Stone and Steel That Would Do Credit to Any Modern City. (2) Treasury Department Building, Canton, China. (3) Pearl River Upon Which Canton Is Located. A Very Busy Waterway Connecting Hong Kong 60 Miles Away. (4) Office of the Mayor of Canton, China. (5) Canton Government Customs House, a Beautiful Granite and Steel Structure.

cause. Freedom and uplift of the people, release from the domination and graft of the foreigners who for ages have sat upon the throne at Peking, have been the objective of this man. Self-interest is of him a thing apart. He has suffered everything but death that the people, his people, might get that which was their right.

In 1911, as a direct result of his labors, the Manchu dynasty was overthrown. He was made the first constitutional president, against his own desires, but soon relinquished the presidency to another he believed would be faithful to the people.

But a year or two elapsed when the constitution was abandoned, parliament was dissolved and the old conditions of graft and military rule again became a reality. The fight for freedom and democracy was again started, and early in 1921 parliament, which had been thrown to the winds by the Peking power in 1917, was again convened at Canton, Dr. Sun once more becoming constitutional president.

But, even before this political development, the city of Canton, the home of Dr. Sun, was pregnant with the modern thought which he and his foreign-educated compatriots had preached. The city had already begun to show signs of the modern progress which is now rapidly becoming a reality.

We are indebted to the *China Review* for the following facts:

Road Building.

Canton has a total of 24½ miles of modern roads and streets within the city limits. Of this total mileage, approximately 8 miles were completed before the establishment of the municipality, 9 miles have been built in the fraction over half a year since its establishment, and the remaining 7½ miles are at present in process of construction. These streets range in width from 80 to 150 ft., including sidewalks, and are constructed of cement concrete or lime concrete. At the same time the Department of Public Works is utilizing as much as possible of the bricks and rock obtained from the demolition of the city wall in the making of the roadbed. To accomplish the present project of street building, 3000 houses had to be condemned and torn down, 1300 ft. of old canal filled in, and about 6½ miles of city wall demolished. Much of the present roadway has been built on the site of the old city wall and of canals which have been filled in.

Public Health and Sanitation.

The Department of Public Health of Canton in the course of 4 months, that is, April to July, 1921, inclusive, has thoroughly cleaned 126 drains with a total length of about 53,121 ft. Much repairing was also necessary to make these drains serviceable. The department is faced now with a very difficult problem. These drains so far put in condition are but the effluents or distributaries of a system of some 42,000 ft. of very old drains running all through the old section of the city, over which houses have been built in many places. These drains are said to run under 300 private dwellings.

Hence, apart from the question of the engineering skill involved in cleaning and repairing this sewer system, many delicate problems arising out of the property rights of the persons who have built over these drains must be faced. The department is now studying the problem and hopes for a satisfactory solution. In the improved sections of the city there has been laid a modern sewerage system which is now in operation.

The department has now in force a new set of sanitary regulations governing restaurants, hotels, theaters and other public places. Building regulations and pure food regulation are also in force.

The department realizes that it is necessary to educate the mass of the people to the need for sanitary precautions, and to this end distributes pamphlets and circulars outlining the dangers of lack of sanitation and hygiene. It has also held a series of public demonstrations and exhibitions.

This department has divided the city into six sanitary districts. For each district there is a staff of five officers, consisting of a chief, two inspectors and two overseers. The department employs about 1000 men as street cleaners. Rubbish is removed in the narrow streets by burden carriers and in the large streets by cart. Each sanitary district submits a daily report of sanitary conditions in the district, and statistics on the subject are kept in the department.

Activities of the Department of Public Works.

This department has plans under way for three public gardens or parks. The first has an area of 800,000 sq. ft. and is said to be almost completed. It is situated on Wai Oi Road, Center. The second, situated on the East Parade ground, with an area of about 1,500,000 sq. ft., and the third, situated on the Island of Hoi Chu, commonly known as "Dutch Folly," with an area of about 44,000 sq. ft., are now being planned. In the second public garden an athletic field for the use of the public is planned.

Other activities include the organization of departments of Public Safety and Education, both departments being organized under the very latest plans used in other large cities of the world.

Modern American Industries.

As a national uplift, and one calculated to bring the Chinese Republic quickly to the rank of an industrial nation, Dr. Sun Yat-sen has worked out a plan that is both practical and unique. This plan has been ratified in all its details by parliament, and is now being carried into effect through a contract entered into between the Republic and George H. Shank, one of Chicago's largest contractors.

Mr. Shank's contract calls for the establishment of American manufacturing industries in China to the extent of $100,000,000. These industries will be wholly and completely financed by this sum which is to be raised by an issue of 8% gold bonds. The contract specifically states that:

The government of the Republic of China is prepared to issue bonds to the amount of $100,000,000 gold to be designated as the Tenth Year Industrial Gold Bond Loan of the Republic of China.

The aforementioned bonds will be issued in denominations of $1000 and will bear interest at 8% per annum, payable semi-annually.

The proceeds of this bond issue will be applied to the industrial development within the provinces of the Republic of China.

The expense for operation shall be paid out of the bond loan and the proceeds from said enterprise. The said George H. Shank shall operate said enterprise for the full term of this contract.

Thus, the people of China will become the outright owners of a group of American built industries that will be operated by American technical staffs. These industries will be the last word in their respective lines. Their operation will embrace the most efficient methods and the American management will continue for a period of 20 years.

The contract provides a wonderful opportunity for American manufacturers to assist China in establishing herself and at the same time profiting thereby.

The world has 61,974,653 gross tons of ships, and every maritime nation of importance, with the exception of Greece and Germany, has more tonnage under its flag than was registered at the outbreak of war.

Features of Illumination for St. Mark's

Example of What Has Been Done in One Case to Apply Principles of Illumination to Particular Problems Found in Church Auditoriums — Concealed Lighting and Colors Found Useful

Belief that a system of church lighting could be worked out which would be not only good technically and correct aesthetically, but which would also contribute to the devotional feeling of a congregation, is back of the installation of a new lighting system in the old St. Mark's church on East Tenth street, New York City. Until a few years ago this church was either unknown to the majority of New Yorkers or heard of only as the burial place of Peter Stuyvesant. Possibly the curious had at some time made an excursion to this out-of-the-way oasis in Manhattan's East Side. Undoubtedly, these people had noted the fine old structure with its garden and churchyard, giving a sigh of regret that such a lovely spot should be lost among a foreign population and the neighboring tenements and shops. Only the most imaginative would have dreamed that a large and active parish could be built up in such an unpromising locality.

Taking advantage of the recent downward swing of city residence, as manifested by the renewed popularity of lower Fifth avenue, Washington Square, Gramercy Park and Stuyvesant Square, those in charge of St. Mark's have managed to make it hold its own in its alien setting, and have even inaugurated a movement to redeem the surroundings. Thus it is that this fine old church, relic of the days when Second avenue was a place of fashionable residence, now can boast a membership with a special flavor and interest of its own. Cut off from the usual resources of a neighborhood parish, St. Mark's has drawn about it many people whose week-day concern is with

Sanctuary and Altar of St. Mark's Illuminated by Means of Reflectors Concealed Behind Imposts of Chancel Arch.

arts or letters, and who naturally favor improving the aesthetic appeal of the church.

With this in view, a lighting expert was called in, Claude Bragdon, an architect of Rochester, better known for his work in connection with the outdoor illumination of the Song and Light Festival staged in Central Park, New York City. Incidentally, Mr. Bragdon was also responsible for the lighting in Walter Hampden's productions of "Hamlet" and "Macbeth." Accordingly, Mr. Bragdon set to work to design a lighting system intended to promote a religious atmosphere as decorative stage-lighting is called upon to create a dramatic atmosphere.

It is obvious that the ordinary lighting schemes such as are used for stores, hotels or theaters, and so forth, are entirely out-of-tune with the requirements of a devotional service, which needs, according to Mr. Bragdon, a general sense of dimness—the "dim, religious light" of Milton. But in spite of this dimness there must be adequate illumination at the reading desk, for the pulpit and in the choir. Besides these utilitarian demands there must be, aesthetically and religiously, the glow of light in the chancel and upon the altar. It will thus be seen that the problem of really adequate church lighting is far from simple.

To furnish the gentle, unassertive lighting for the body of the church use has been made of chandeliers which are, in effect, boxes open at the bottom, but permitting a little play of light through stained-glass panels in the sides. These chandeliers are equipped inside with reflectors and color screens, the whole concealed from view by a single sheet of opalescent glass. In each fixture there are four 150-watt type C lamps, each contained in an X-ray extensive-type glass reflector. Each color is on its own electrical circuit and can be separately dimmed so that any color or combination of colors can be made to appear on the diffusing glass, while when all the colors are used the glass assumes a prismatic appearance. By directing it where needed, light is given for the pews without interfering with the general sense of dimness throughout the auditorium. By this arrangement the worshipper in the pews loses distracting consciousness of the walls and ceiling, which are eliminated as far as the eye is concerned simply by keeping light off them.

General Illumination of the Church Is Obtained From Fixtures Suspended From Ceiling and Under Gallery.

In contrast to this the sanctuary and altar are brightly illuminated by means of concealed reflectors placed behind the imposts of the chancel arch. A single spotlight, from a concealed source, is directed downward upon the altar, which can thus be suffused with a white light when the chancel lights are turned off. Similarly, the pulpit and choir can be independently illuminated by means of concealed spotlights. Separate lighting is likewise provided for the gallery.

Such a system as this, possible only with electricity, is flexible and capable of considerable variation; in other words, it constitutes an instrument for the production of a variety of effects appropriate to different uses of the church edifice and inductive of different moods on the part of the worshippers. Undoubtedly, it represents a distinct advance in church lighting and suggests the infinitely great possibility of developments in this field.—*Edison Monthly.*

The 1921 Year Book of the American Chamber of Commerce for Italy, to be published at the end of the year, will be made far more efficient as a trade directory than in past years. The alphabetical list of members will contain lines of merchandise dealt in as well as names of firms represented. The classified list will be thoroughly revised and subdivided more in detail. This will result in a greatly improved service of publicity to the various members who will be listed in the latest edition.

The Year Book is used a great deal for replies to inquiries, both by mail and verbally. It is always the first trade directory to be consulted by the chamber. Copies are sent to all the American consulates and chambers of commerce in Italy, and also to various trade associations in the United States. It is in use constantly throughout the entire year.

Effect Produced by Floodlighting of a Municipal Christmas Tree

There is a thrill for children and grown people alike in the spectacle of a mammoth outdoor Christmas tree which is completely bathed in light from floodlighting projectors. Many cities have their municipal Christmas trees, most of them elaborately trimmed with tinsel, crystal and other scintillating ornaments. By flooding the tree with light it stands out in brilliant grandeur. The ornaments dancing in the breeze sparkle and glitter, and the softly falling snowflakes floating into the light and falling softly to rest upon the branches of the tree produce a thrill in the breasts of everybody.

Colored lighting effects, as well as white, are possible with the use of "X-ray" projectors. The floodlighting projectors may be mounted on adjacent buildings or on posts, and the light can thus be effectively projected over the entire tree. No town or city with a municipal Christmas tree should fail to provide for floodlighting it. It is in keeping with the true spirit of an electrical Christmas. This plan has been successfully followed in Chicago and other large cities.

Municipal Christmas Tree of the City of Chicago, Floodlighted by "X-Ray" Reflectors.

EDITORIAL COMMENT

Lighting the Generating Station

On other pages of this issue is given a description of some of the prominent features of the new station of the Hartford Electric Light Co. The engineers who designed and built the plant are to be congratulated on the thoroughness of the manner in which they have handled the many details required to make such a station an operating reality. Brief comment on the lighting will serve to show how fully each detail has been covered.

Particular attention was paid to the lighting of the station in order to secure ample illumination at all points. The firing aisle in the boiler house, the main turbine room, the switchboard operating room and the load dispatcher's room all secure natural lighting through skylights in the roof. Artificial lighting is provided in the boiler house so that the firing aisle and space over and back of the boiler is amply illuminated, special lighting being added directly over the stokers, at the water columns, instruments, valves, stairways and other points where light is of particular importance. All fixtures in the boiler house are of the heavy-duty type, using castiron outlet boxes with castiron hoods and steel reflectors. All sockets are of porcelain arranged so that smoke and fumes cannot reach the interior. In the ash cellar and similar locations vaporproof fittings are used and heavy guards are provided wherever necessary.

The turbine room is lighted from industrial-type fixtures suspended from the overhead trusses, arranged so that general illumination is secured on the condenser floor as well as on the turbine platform. Local lighting around the condensers and auxiliaries is provided in addition. All of the lighting is supplied normally from lighting transformers with automatic regulators, but in case of trouble on the a-c. circuits a portion of the lights is automatically connected to the station battery. These lights are sufficient in number to secure illumination which will temporarily permit safe operation of the station. All lighting circuits are fed from cabinet panels placed at convenient locations, all of these panels being fed from the main lighting panels in the auxiliary-power switchboards.

The electrical bay, the reactor room and bus rooms depend entirely on artificial illumination, the circuits being supplied from panels located in the south end of each room adjacent to the main operating stairway. The normal lighting circuits are operated only from the cabinet panel and the room must, therefore, be entered to operate these lighting switches. An emergency circuit is, however, operated from a switch located in the hallway adjacent to the doorway entering the room and a wired glass panel covered by a metal slide is placed in the door so that an operator can turn on the emergency lights and view the conditions existing in the room before entering. Similar provisions are made in the oil circuit-breaker room, although natural light is available in this room during the daytime. The main switchboard control room is artificially lighted by lamps placed above a glazed ceiling directly under the skylight, thus securing well diffused light on the switchboard. Emergency lights are also provided in this room.

Electric Power Surveys

The consideration of electricity in competition with other motive power is clearly an engineering problem, and central stations which view it as such are reaping the reward of their painstaking work. Within the past 5 yrs. the most progressive companies have taken up the so-called "power survey" as an essential feature of electrical applications recommended to prospective purchasers of motor service, and have embodied the results of their investigations in more or less complete reports submitted to the prospect before the securing of the latter's name upon the significant "dotted line." Considerable publicity has been given to this method of securing power business, and there is not much room for discussion as to its advantages both from the standpoint of impressing the consumer-to-be with the precision and technical resources of the central station and from the viewpoint of the latter's record files. There is, however, need of emphasizing some of the important points which should be treated in work of this kind in order that the power survey and the recommendations based upon it may be of the utmost possible benefit to both the consumer and the company.

In too many cases power surveys suffer from incompleteness and are, subsequently, of little value in the gaining of the business for which they are primarily prepared. A critical study of many of these documents discloses the frequent omission of such data as the sizes of existing boiler and engine plants, actual tests of steam consumption under commercial load conditions, lists of machines operated by the old system and the assumptions made as to interest, depreciation and

other fixed charges entering the final determination of cost of service. The practice of taking indicator diagrams in order to estimate the average power consumption of the existing installations is generally followed, but on the basis of these tests the power company too often depends upon a mere estimate of the steam consumption, assuming a fixed average rate of evaporation and fuel economy for the local conditions.

This lack of data is often excused on the ground that the report based upon the power survey is intended solely for the prospective consumer, and it is contended that as long as the latter knows what his equipment layout is no need exists for putting it down in black and white in the recommendation of the central station company. As a matter of fact it is of no small importance to the latter to accurately list the machinery which it is proposed to drive by motors, the reason being that a given cost estimate applies to a stated layout of equipment and when alterations come, as they are almost certain to in the future, the power company should not be held to a performance on the cost basis which is in any way indefinite or ambiguous. As for careful tests or measurements of plant performance, it is not open to question that a company which takes the pains to make these is in a much better position to forecast the savings possible by electricity than one which makes what is at best but an educated guess as to the fuel and water consumption of the installation. Many factory owners keep records of coal consumption which are practically worthless from the engineering standpoint, and the least that a power engineer should do in trying to determine present costs in advance of an electrical installation is to investigate the coal and labor requirements through a period sufficiently extended to give a line on the maximum expenditure to be anticipated for these items in a comprehensive estimate of total expenses. An analysis determined by the indicator may show that the motor drive will result in a wide margin of increased efficiency in cost per unit of product so that detailed tests of steam and fuel consumption will not be necessary, but in many cases, and especially where steam heating enters the problem, the margin is closer and fairly accurate data are absolutely necessary for the preparation of a safe estimate.

A power report of the best type, therefore, presents a general engineering description of the installation to be electrified; gives a sound estimate of its total yearly cost of operation, including fixed charges; contrasts this cost with the estimated cost, including fixed charges, of running the plant with electric drive on central station power, including steam heating if required, and lists every motor and machine, with full information as to ratings, speeds and capacities. In many cases the report also includes blueprints showing the projected motor layout drawn to scale, and refers to similar installations which may be examined as more or less perfect models of electrical operation. The company that assembles its power-service material in this way accumulates a file of the greatest value and is in a position to capture business upon exceedingly close margins.

Central-Station Power for Municipal Pumping

Among the largest potential customers for electrical energy in this country are our cities. Nearly every large city owns and operates its own water system and in the operation of these systems large amounts of power are used. However, it has only been within recent years that this subject has been given the consideration it deserves, due perhaps to the fact that the central station, when not municipally operated, feels that the time and effort necessary to convince the municipality of the advantages of electric pumping are not worth the prospective business. It is true that, as a rule, the municipality is a difficult customer to obtain; political situations must be overcome, as well as in many cases a lack of knowledge of the true conditions surrounding the operation of the pumping plant by the municipality. Nevertheless, every effort should be extended to show the saving that can be effected through the purchase of energy developed under central station conditions, as well as the lesser space and lower cost of maintenance of electrical pumping apparatus, as municipal pumping is a business that offers a great many attractive features from the central station standpoint.

Of the two general systems of pumping in vogue in this country, that wherein a reservoir is provided so that water may be supplied after the pumps are shut down is the most attractive to the central station and is the easier to obtain on a profitable basis. With such a system the pumping can be very largely done at such times as best suits the load conditions of the central station, and so can be made practically off-peak business for which a very low rate can be offered with mutual profit.

In the direct system no reservoir is provided, the rate of pumping varying directly as the demand for water. While this system does not offer so great an attraction to the central station, it must be remembered that the greatest demands for water are during the summer months when the demand for electric energy is least; then an annual diversity-factor is offered that should make the business profitable. Some municipalities, however, in spite of the proven reliability

of central station service lack confidence in the ability of electric service to operate the pumping machinery without interruption.

In these cases probably the best method of securing the business is by advocating a combined station, the old steam equipment to operate during peak months and motor-driven pumps to carry the regular load. This arrangement gives the central station a diversity factor that should be most acceptable. Where the central station can operate the water supply and install steam and electric pumps in its plant, operating a combined electric and pumping plant, ideal means are offered both the central station and the municipality for increasing the load-factor in the one case and securing continuity of service and minimum rates for the latter.

Automatic Voltage Regulators

One of the slogans of the central station industry at the present time is "service," and an endeavor is made by every progressive company to make its service just as satisfactory as possible. Moreover, state commissions are paying considerable attention to the question of service and insisting upon improvements whenever it is permitted to deteriorate beyond a certain point. One of the principal elements in good electrical service is the maintenance of voltage upon the lines without excessive fluctuations above or below the normal value.

One of the greatest helps in maintaining approximately constant voltage upon a line is the use of the automatic voltage regulator, and on a-c. systems where long feeders are most likely to be met the induction type of regulator seems to be generally preferred. It has proven its reliability and its capability of rendering the desired service within the limits of its capacity, and it requires no greater attention than the other apparatus located in the substation. The regulator is usually placed at the substation and is adjusted with the idea of maintaining the voltage constant at the center of the load which, however, may be distributed over a considerable area. Compensation cannot, of course, be perfect because a given load near the point of compensation will have a different effect upon line drop than the same load at a distant point. Where feeders are long it may consequently be more desirable to place the regulator at the distant end of the feeder, and there are available outdoor or pole types of induction regulator which meet this need and which have proven advantageous in a number of cases.

It is generally thought that the provision of good service is an expensive luxury which is only justified in an endeavor to give greater satisfaction to the customers of a utility company. This, however, is not an entirely correct point of view, for in many cases the provision of automatic regulators actually results in a saving to the operating company. They may, for instance, make it unnecessary to increase line capacity which would otherwise be required to prevent undue drop on the line. To take a specific instance, suppose the load upon a given feeder has increased so that at the peak hours the line drop is more than can be tolerated and yet the peak load exists for such a short time that investment in additional copper to provide greater carrying capacity is not warranted from financial considerations; that is to say, additional carrying capacity is indicated for voltage maintenance, but not for energy saving. In such cases a voltage regulator will bring the voltage fluctuations within the necessary limits during the times of peak load and will be much less expensive in many cases than the provision of larger feeder capacity.

Station Auxiliaries

Selection and use of auxiliaries still continue to present an important problem to designers and operators of generating stations. That the problem is not confined to practices in this country alone is evidenced by the following quotation from *The Electrician* (London):

"A subject upon which a discussion can usually be raised with some ease, because upon it there is great difference of opinion, is whether it is better to drive power-station auxiliaries by small turbines or by electric motors. There is, it is evident, a good deal to be said on both sides. On the score of continuity of supply and easy starting up in case of breakdown, it is clear that at least one complete set of auxiliaries should be steam-driven so as to get the station going with the least possible delay after any accident. On the other hand, it is probable that, taking all in all, the electric drive requires less steam per horsepower, though when the exhaust steam from the auxiliary turbine is used in the feed-water heater the actual quantity of heat employed may be slightly in favor of turbine operation. But there are other ways in which the electric drive scores. For driving the pumps, motors may, for example, be considered ideal, as they require hardly any attention, and if a-c. supply is available, as is now nearly always the case, the speed is practically constant on varying loads. On the other hand, the governing of small steam turbines on varying loads is by no means all that can be desired. To us, therefore, it seems, with the exception noted above, that greater economies both in capital charges and in running costs can be obtained by using the electric drive to the greatest possible extent."

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

LIGHTING FIXTURE ORGANIZATION WANTS SLOGAN.

The National Council Lighting Fixture Manufacturers has decided to have a slogan which will be in keeping with the size and influence of so great an organization, and which will express in a short and effective manner the aims and ideals for which it stands. But what is particularly interesting to the readers is that the National Council is offering $100 for the best slogan, $50 for the second best and several $10 awards.

All are invited to enter the contest, whether they are members of the National Council Lighting Fixture Manufacturers, or the Dealers' Society, or not. It is a question of getting the best slogan. Nothing else counts. So, when you get home tonight and when after dinner you are comfortably esconced in your armchair or rocker, think up a real peppy slogan, send it in to the "Slogan Committee" and then come to the Milwaukee Lighting Fixture Market and hear the result of the contest.

EDISON PIONEERS TO PERPETUATE ITS ORGANIZATION.

Revised Constitution Provides for Class of Membership Known as "Descendant Members" Consisting of Sons or Daughters of Actual Members.

For the purpose of perpetuating its organization and to keep alive for future generations the marvelous activities and contributions to science of Thomas Alva Edison, the Edison Pioneers, an exclusive society consisting of men who had been intimately associated with Mr. Edison in the early and memorable days of his career, met in special session during the afternoon of Nov. 3, the following members being present: Frederick A. Scheffler, president; John W. Lieb, ex-president; Major Wm. J. Hammer, ex-president; Charles E. Estabrook, treasurer; Wm. H. Meadowcroft, historian; Frank A. Wardlaw, secretary pro tem; T. Commerford Martin; Alfred W. Kiddle; Albert E. Winchester; Robert A. Carter; Howard A. MacLean; John Dwyer; F. G. Daniell; Alex. Mungle; W. S. Mallory; W. M. Brock and W. S. Barstow.

A special committee, of which Alfred W. Kiddle was chairman, reported to the meeting that it had concluded its labors on the revision of the society's constitution and by-laws, which was read for the information of and approval by the members. This revised constitution provides for a class of membership to be known as "Decendant Members," to consist of the sons and daughters of actual members, who may be elected to membership during the life of the parent member, or by the executive committee should the parent member be deceased, it being resolved that but one such son or daughter should be eligible for membership at a time. In this manner, a practically endless chain is formed, and presents the opportunity for membership to many, hitherto debarred, whose parent now deceased would have been eligible to membership in the society upon its formation, or since.

Through the courtesy of the Association of Edison Illuminating Companies, the Edison Pioneers share with them the occupancy of spacious and well-furnished rooms on the ninth floor of the Engineering Societies building, 29 West 39th street, New York City, where it is the intention to gather together, if possible, models of early apparatus and such other articles of historical and educational value as may be obtainable, for the conception and ultimate practical utilization of which the scientific and industrial world owes so much to the transcendental genius and achievements of Thomas Alva Edison.

The secretary's office is temporarily located at room 2077, 50 Church street, New York City.

S. E. D. MAKES THREE ADDITIONS TO ITS PERSONNEL.

Enlarged Activities of Society Necessitate Adding to Staff—Christmas Campaign Nearing Climax—Standardization of Printed Matter.

To handle new and enlarged activities of The Society for Electrical Development the following recent additions to its permanent staff have been made: Walter S. Dickson, research department.—Mr. Dickson brings to the Society a broad experience in engineering and research work. He has made extensive business trips both in this country and throughout South America in the interests of large engineering projects. He has given a great deal of time to further the work of the several national technical societies of which he is a member. His activities have been associated with the electrical manufacturing interests, public utility properties and prominent consulting electrical engineers. During the present period of reconstruction Mr. Dickson has done active work on engineering committees dealing with large public problems. Mr. Dickson's work for the Society will consist in part in gathering and interpreting statistics and other information of value to members.

Mrs. L. C. Read, to head the newly formed department of home economics.—Mrs. Read is by previous experience equipped to secure for the Society and the industry additional publicity

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through news items for the daily press and articles for class magazines. Mrs. Read will also devote a part of her time to addressing meetings of women's clubs on the application of electricity to the modern home.

Mrs. Lillian Cassels, department of home economics.—Mrs. Cassels is an exceptionally capable writer and appreciates thoroughly the woman's point of view. She has the happy faculty of being able to inject interest and charm into the most commonplace subjects. She will prepare newspaper feature articles, special magazine items and copy for booklets for distribution to the public.

The Society's Christmas campaign is nearing its climax. At the time of writing orders for window display material, gift suggestion folders and newspaper advertising cuts are coming in fast. The industry is quite evidently determined to "bring back business by getting busy selling."

As a step toward standardization of printed matter the Society has adopted three sizes for its publications. The smallest will be approximately 3⅜ by 6 ins.—a size suitable for envelope inclosures, small pamphlets and reprints of short articles. The next size will be 6 by 9 ins., a size used by many manufacturers for catalogs, by publishers of house organs and conceded by many as one of the most convenient sizes for all-around purposes. The Society's *Monthly Sales Service* will be issued in the 6 by 9-in. size beginning with the January, 1922, issue. Future "How-To" booklets or monographs, statistics and general bulletins will also be published in this size. The largest size, for general use, will be 8.5 by 11 ins., which is already standard for letterheads and a wide variety of general purposes. Reprints of magazine articles, circulars for attachment to letters, etc., will be printed on this letter size sheet.

NOMINATION AND ELECTION OF A. I. E. E. OFFICERS.

As provided in section 19 of the by-laws of the American Institute of Electrical Engineers, candidates may now be proposed for nomination for the offices to be filled at the next annual election in May, 1922, by the petition or by the separate indorsement in writing, of not less than 25 members. The petitions or separate indorsements must be in the hands of the secretary not later than Jan. 25, 1922. For the convenience of members a form of petition has been prepared by the secretary, and copies of it may be obtained upon application to Institute headquarters. Indorsements may, however, be made by letter if the form is not available. A member is not limited in the number of candidates he may indorse in this manner. The officers to be elected are: A president and a treasurer for the term of 1 yr. each, five vice-presidents for the term of 2 yrs. each (one from each of the odd numbered geographical districts), and three managers for the term of 4 yrs. each.

The five odd numbered districts from which vice-presidents are to be chosen at the May, 1922, election are as follows: (1) North Eastern—Connecticut, Maine, Massachusetts, New Hampshire, New York (exclusive of N. Y. section territory), Rhode Island, Vermont; (3) New York City—Territory of the New York section, Canal Zone, Porto Rico, all foreign countries (Canada excepted); (5) Great Lakes—Illinois, Indiana, Michigan, Wisconsin; (7) South West—Arkansas, Kansas, Missouri, New Mexico, Oklahoma, Texas; (9) North West—Idaho, Montana, Oregon, Utah, Washington, Alaska.

According to the revised constitution, while one vice-president must be elected from each of the five odd numbered districts, this does not debar members in one district, if they so wish, from nominating and voting for a candidate in another district. When the votes are counted the candidate for vice-president having the largest vote in each district will be elected to that particular office for that district, irrespective of the fact that he may have polled a smaller number of votes than a candidate standing second in another district.

OCTOBER ELECTRICAL EQUIPMENT EXPORTS.

The exports of electrical goods to foreign countries for October were valued at $4,970,332, compared with $9,988,215 for the corresponding month in 1920, or a decrease of $5,017,883. For the 10 mo. ending October, 1921, the total exports amounted to $86,320,260, an increase of $8,661,064 over the 1920 figures and an increase of $10,600,393 over the total for the 10 mo. ending October, 1919.

The following classified figures give the detailed data for October, 1921, compared with the corresponding month for the previous year:

ELECTRICAL MACHINERY AND APPLIANCES.

(Except Locomotives.)

	October, 1920.	October, 1921.
Batteries	$ 483,109	$ 211,758
Carbons	137,760	26,526
Dynamos and generators	970,840	779,338
Fans	55,212	15,444
Heating and cooking apparatus	182,715	74,302
Insulated wire and cables	575,041	177,536
Interior wiring supplies, including fixtures	282,999	86,822
Lamps—		
Arc	1,548	1,250
Incandescent—		
Carbon filament	16,871	3,980
Metal filament	354,536	104,889
Magnetos, spark plugs, etc.	317,891	140,068
Meters and measuring instruments	254,876	161,462
Motors	1,255,539	525,142
Rheostats and controllers	64,251	77,735
Switches and accessories	425,615	176,154
Telephone apparatus, including wireless	24,751	42,769
Telephone	282,488	163,397
Transformers	785,300	464,281
All other	3,516,873	1,737,479
Total electrical machinery, etc.	$9,988,215	$4,970,332

UTILITY CONDUCTS HOUSE-WIRING CAMPAIGN.

A house-wiring campaign inaugurated last month is in progress in all parts of the territory served by the Public Service Co. of Northern Illinois. It is stated that the electrical contractors in the towns are co-operating strongly, working along the lines of definite plans which latter have

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been figured out and discussed at meetings. The contractors' names are being carried in newspaper advertising. In addition to this form of exploitation, prospects are being communicated with direct. The results so far are excellent. Notwithstanding all that has been done in the direction of connecting up domestic customers there remain in the territory a great number of houses without electric light. No doubt is felt that a dent will be made in the mass as an effect of the current concerted movement.

Sales of appliances for the calendar year ending 30 days hence will show as to some articles a considerable increase over the same period in 1920. Among those actuated by electricity the labor-saving devices continue in the lead, though of these one or two have failed to tally up the sales volume achieved by them in the period immediately following the ending of hostilities in the great war. The electric range has pushed itself further to the front in the past 11 mo. The number of installations made considerably exceed those of 1920. A number of demonstrations have been made in various towns each being first advertised extensively. On each occasion the range has been demonstrated by a qualified expert. At no time have these exhibits failed to attract numerous interested visitors. It is notable that a considerable percentage of the sales made have been to people living in the smaller towns.

The retail merchandise sales department's plans for the Christmas and holiday trade have been carefully made. An artistic arrangement of goods in all the sales rooms is part of the general scheme. Those in charge of the sales rooms are earnestly joining in realizing this idea.

OCTOBER CONSTRUCTION 25% AHEAD OF LAST YEAR.

Building contracts awarded during October in the 27 Northeastern states of the country, according to the statement of the F. W. Dodge Co., amounted to $222,480,000. This figure is 25% greater than the figure for October, 1920, and only 10% less than the figure for September, 1921, which was a record month.

There was a marked increase in activity in New England during October. Other sections showed moderate declines, well within the range of seasonal declines that were to be expected.

Residential building still leads among the classes of construction, having amounted to $89,650,000 in October. This was 40% of the total construction for the month.

Second in importance was the business buildings group, amounting to $37,405,000 in October, or 17% of the total, a very good showing for this class of work.

Public works and utilities amounted to $35,141,000 in October, about the same as the September figure.

Industrial building in October amounted to $18,419,000, an increase of 63% over the September figure.

Contemplated new work reported in October was 24% greater than in September.

Considering the large volume of construction started within the past 2 months, it appears that activity will continue at a very substantial rate throughout the winter months.

OFFICERS ELECTED BY ELECTRIC CLUB OF CHICAGO.

The Electric Club of Chicago held its annual meeting Dec. 13 and elected the following officers: President, Walter G. Luscombe; first vice-president, L. W. Donoho; second vice-president, Paul W. Koch; secretary, J. W. Collins; treasurer, Otis L. Johnson; trustee for 3 yrs., W. A. Jackson; directors, T. A. Brook, James A. Dawson, Malcolm Carrington and J. C. Hale. Mr. Luscombe, the newly-elected president, is division commercial superintendent of the Illinois Bell Telephone Co., and has been in the telephone service in Chicago for 42 yrs., having started as a boy operator in the old Calumet office. He has been division commercial superintendent since 1914.

ACTIVITY NOTED IN ELECTRICAL SUPPLIES IN THE EAST.

Dealers in electrical supplies, both at New York and Philadelphia, report increasing activity in business with the approach of the holidays. In the first named city there is a heavy demand for wiring materials of all kinds, particularly for dwelling installations, and prices of certain specialties are showing pronounced firmness. Electrical conduit shows a tendency to increase in price, while flexible armored conduit, operating under a fine call, is moving rapidly, depleting local stocks, with the supply available from manufacturers limited. At Philadelphia the demand for decorative equipment for the holiday season is growing, while supplies, in general, are operating in an encouraging market. The call for lighting fixtures is low and falls far short of the usual buying movement at this time of year; this branch of trade is not very optimistic and looks for but moderate business for a number of weeks to come.

A. A. E. TO HELP CONSTRUCTION THROUGHOUT COUNTRY.

At the quarterly meeting of the board of directors of the American Association of Engineers, held in Chicago last month, steps were taken to push construction and public service activities immediately through the 220 local units of the association. The meeting decided that the local organizations of the association should stimulate construction throughout the country, especially in municipalities, in accordance with the suggestions and plans of the National Employment Conference held recently in Washington through active co-operation with municipal, federal, and state authorities.

Similar action was also directed to the end that municipal engineering service be improved through an educational campaign for (1) more

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certain tenure of office; (2) having technical engineering work supervised by engineers; (3) puting compensation on a basis of qualifications and service rendered; (4) insisting that only the highest grade of engineering service be accepted; (5) extensive co-operation with local civic organizations, and (6) encouraging engineers to prepare popular articles about municipal work such as paving, sewerage, sewerage disposal, sanitation, water supply, city lighting and city planning.

The point was emphasized that this educational work should be more for the general public and not so much for engineers.

MONTEFIORE PRIZE AWARDED TO DR. WHITEHEAD.

A triennial prize of 5000 francs given by the Foundation George Montefiore, Liege, Belgium, has been awarded to Dr. John B. Whitehead, professor of electrical engineering, The Johns Hopkins University, Baltimore, for his research work in connection with a paper on "The Corona Voltmeter and the Electric Strength of Air," written by him in collaboration with a graduate student, T. Isshiki, and presented before the American Institute of Electrical Engineers at the White Sulphur Springs convention, June, 1920. The prize is awarded by a jury of 10 electrical engineers, of whom five are Belgian and five from other countries, for the best original work on scientific advancement or progress in the technical applications of electricity in all its branches.

GENERAL ELECTRIC CO. TO PAY 5% BONUS TO EMPLOYES.

According to advices from Schenectady, N. Y., the General Electric Co. has announced through a letter issued by President E. W. Rice, Jr., that the 5% supplementary compensation to employes who have been in the service of the company for 5 yrs. or more would be paid for the 6 mo. ending Dec. 31, 1921. Employes who have been in the company's service 5 yrs. or longer on that date will be eligible for this payment. The last payment of 5% supplementary compensation for the 6 mo. ending June 30 amounted to $1,067,899.29 and involved 24,773 employes.

WISCONSIN UNIVERSITY TO HOLD SCHOOL FOR METERMEN.

The first school for electric metermen was held at the University of Wisconsin, Madison, Wis., from Jan. 31 to Feb. 4, 1921. The number in attendance and their enthusiasm make the work a success far surpassing the most sanguine expectations of those who promoted the enterprise.

The second session of the school will be held during the week beginning Jan. 23, 1922. It is planned to conduct the work in much the same manner as it was conducted last year with such modifications as experience has shown desirable. One of these modifications (if the attendance justifies it) will be the division of those taking the work into two groups, one group including those who attended last year. These will be expected to do more thorough and advanced work. The other group will include those who are attending for the first time. The plan so far formulated contemplates devoting the session of the last afternoon to a discussion of the rules of the Wisconsin Railroad Commission affecting electric meters. It is hoped that all attending metermen will take part in the discussion and suggest modifications or improvements in the rules.

DISCUSS TRAFFIC REGULATION AT I. E. S. MEETING.

At the Dec. 15 meeting of the New York section of the Illuminating Engineering Society held in the Engineering Societies building, 33 West 39th street, New York City, the subject of traffic regulation was considered. Dr. John A. Harriss, special deputy police commissioner of New York City, spoke on "Signal Control of Traffic," while Robert Grier Cooke, president, Fifth Avenue Association, discussed "Traffic on Fifth Avenue." The concluding address was made by E. A. Warner, Union Switch Signal Co., on "Highway Traffic Signaling With Colored Lights."

CAMPAIGN FOR NEW BUSINESS.

Electricians employed by electrical contractors at Wilmington, Del., as well as employes in other departments of operation, are developing a campaign for new business, irrespective of their employers. The men are seeking all manner of jobs for the shops in which they work, and great stimulation in trade has resulted. It is said that wiring and miscellaneous repair work is being done in hundreds of homes, stores and other establishments as a result of this activity.

COMING CONVENTIONS.

American Building Exposition, new Cleveland Auditorium, Cleveland, Jan. 4-14. Assistant manager, R. G. Collier, 1305 Schofield building, Cleveland.

Massachusetts State Association of Electrical Contractors and Dealers. Annual meeting, Springfield, Mass., Jan. 5. Headquarters, Hotel Kimball. Secretary, J. E. Wilson, 263 Summer street, Boston.

Western Association of Electrical Inspectors. Annual convention, Chicago, Jan. 17-19. Headquarters, Hotel Sherman. Secretary, William S. Boyd, 175 West Jackson boulevard, Chicago.

Association of Municipal Electrical Utilities of Ontario. Annual convention, Toronto, Canada, Jan. 26-27. Secretary, S. R. A. Clement, 190 University avenue, Toronto, Ont.

Lighting Fixture Dealers' Society of America. Annual convention, Milwaukee, Jan. 30-Feb. 2. Secretary, J. L. Wolf, Builders' Exchange, Cleveland.

National Council of Lighting Fixture Manufacturers. Annual convention and Lighting Fixture Market, Auditorium, Milwaukee, Jan. 30-Feb. 4. Secretary, Charles H. Hofrichter, 231 Gordon Square building, Cleveland.

American Institute of Electrical Engineers. Midwinter convention, Engineering Societies building, New York City, Feb. 15-17. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

Home Beautiful Exposition, Mechanics building, Boston, April 15-29. Manager, Chester I. Campbell, 5 Park square, Boston.

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OPERATING PRACTICE

Methods and Problems Embracing Operation and Installation of Power-Plant Equipment and the Distribution of Electrical Energy

OKLAHOMA ADOPTS STANDARD LINE CONSTRUCTION RULES.

Protection of life and property and standardization of construction are the chief objects sought in Order No. 1946 issued by the Oklahoma Corporation Commission Oct. 31. The order was issued after a hearing on proposed order No. 169, which outlined tentative rules on the subjects of construction of telephone, telegraph, electric and power transmission lines, and inductive interference.

The rules relative to construction follow closely those adopted by the U. S. Bureau of Standards, Washington, D. C., and which are in uniform use in many states of the Union. Only a few rules were adopted on the subject of inductive interference, the issuance of a general order covering this subject being deferred until utility operators and government engineers complete a national investigation, which they are now conducting. The rules adopted by the commission will insure greater safety to workmen and to property along telephone, telegraph and power transmission lines and will improve the type of new construction and be a great benefit to the public as well as to utility operators.

PULVERIZED COAL AS FUEL UNDER STEAM BOILERS.

Dryness and Fineness Important Factors in Fuel Preparation—Efficiency of Recovery Plant Determines Economy of Operation.

By W. G. Clark.

The great interest displayed in all branches of industry on the subject of powdered coal indicates that powdered coal as a fuel will be used more and more as its advantages are better understood, and also as the users become acquainted with the proper way of preparing and handling such fuel. The cost of pulverizing coal depends on several important points; first, the type of pulverizer used and, second, the cost is regulated according to the capacity required. An equipment for pulverizing 3 or 4 tons per hr. will cost but little more than an equipment for pulverizing half that quantity. It has been found that where large tonnage was produced a ton of bituminous coal could be pulverized at a cost as low as $0.32 a ton. The range of costs runs from this price up to $1 a ton, according to the tonnage produced and the type of pulverizer employed.

The power necessary to pulverize a ton of coal enters greatly into the cost, and any step that can be taken to reduce the power required to pulverize coal is a step in the right direction as far as economy is concerned. No one will dispute the fact that the drier the coal is the less power per ton it will require for pulverizing. The writer, therefore believes that it is necessary to dry coal to 1 or 2% of moisture, notwithstanding the position assumed by some that such dryness is not required. Another point as far as economy is concerned is the recovery or the efficiency of the system. A waste of 2 to 5% or more of the product after being pulverized adds to the cost of coal which is ultimately finished ready for use. At least one equipment is guaranteed to recover 99%, and where this system is running the operators realize this recovery. The drier the coal is the harder it is to make a complete recovery of the coal, and so it is assumed that those who do not advocate complete drying are not aware of the fact that such a satisfactory recovery system is available. There are installations in operation where there is as high as 10% loss in recovery. In a plant pulverizing 100 tons of coal per day the waste is 10 tons of coal in such an installation. Multiplying this waste by the cost per ton it is easy to figure the loss in dollars and cents. Aside from this loss consideration must be given to the nuisance to the surrounding community and the unsanitary condition existing in the plant as a result of the presence of a large amount of fine coal being blown about.

Another point in favor of drying coal as low as 1 to 2% of moisture is the reducing of danger of explosion or spontaneous combustion. Coal with 5 to 8% of moisture stored in a bin will cake, and if left there long enough will start to burn. It is also harder to convey fuel in this condition with an air conveying system to the boilers or furnaces. It is also a fact that better combustion can be secured with coal that is perfectly dry when blown in under boilers than can be possibly obtained from coal containing 5 to 10% of moisture.

Regarding the ash in coal, it sometimes occurs that the stacks on the boilers carry off ash that becomes a nuisance to the surrounding community. There is no reason why this cannot be overcome. A properly designed expansion chamber at the base of the stack in connection with a properly designed spraying system will reduce the amount of ash to such a degree that it will not be noticed, no matter how much coal may be burned. At the same time the design of the expansion chamber and sprayers can be so worked out that they will not interfere in any way with the proper draft at the boilers.

Fineness of Pulverization an Important Item in Fuel Economy.

It is advocated by some to not pulverize finer than 100 mesh. The writer takes exception to this, for in his experience with some of the leading pulverized coal people of the country he has found that fuel is the most economical and is the standard fineness for proper combustion and economy when pulverized

95% to 200 mesh. Fuel 100 mesh fine is used in cement kilns as a general rule. Of course, in this 100 mesh fine material there is considerable 200 mesh fuel, but it is believed that if the cement people would set a mark of pulverizing their coal to from 150 to 200 mesh for cement kilns they would find it a paying proposition and that the extra cost for the fine pulverization would be counterbalanced as a result of the more economical fuel. The writer advocates, therefore, on both anthracite and bituminous coal, to pulverize 95% to a fineness of 200 mesh. Such practice will reduce the capacity of the pulverizing plant, but the value of the fuel will be so much higher and the ash question will be so relieved that the finer reduction will pay.

Powdered fuel offers many advantages over fuel in other forms for use under boilers. It also offers many advantages in smelting furnaces, but the writer advocates, first, dried coal, second, fine coal, and third, an equipment that has the following advantages: A pulverizer connected with an air conveying, separating and dust recovery system that will produce a uniform product—95% to 200 mesh—without any loss of material; also an equipment that will not be designed to draw the pulverized coal through the fan.

HYDROELECTRIC POWER DEVELOPMENT IN ITALY.

One of the principal sources of wealth in Italy is the hydroelectric power which can be obtained from the numerous water falls existing there. This wealth is especially valuable at the present time on account of the high price of coal which, being very scanty in Italy, must be imported from abroad. Italians have fully realized this and are devoting all their efforts to the exploitation of hydraulic power. Italy possesses water power capable of developing 5,000,000 hp. of electric energy. Up to 1915 she had 329 installations generating 935,009 hp. From 1915 to the close of 1920, this number was increased by 58, harnessing another 217,122 hp. to industry, and 54 are now under construction, which will add a further 359,213 hp., bringing the total to 1,511,344 hp. exclusive of minor installations of a capacity of less than 300 hp. each, which, if included, would bring the figure up to 1,750,000 hp. That leaves 3,250,000 hp. still available for Italian industry.

In connection with these installations 59 artificial lakes have already been built, having a capacity of 8,114,000,000 cu. ft. of water. Seventeen are now under construction, with an estimated capacity of 28,313,000,000 cu. ft. Among the new plans one of the most important is that of the Societa delle Forze Idrauliche della Sila. It consists of a reservoir of the capacity of 500,000,000 cu. ft., located in Calabria, in the extreme south of Italy, capable of developing continuously about 150,000 hp. The transmission line connecting the powerhouse with the city of Naples will be about 250 mi. long and will be operated at 165,000 volts. Another line, 150 mi. long, operated at the same voltage, will furnish the province of Puglie with electric power. The capital of the company is now almost 15,000,000 Lire and it must be raised to 60,000,000 to complete these works. A commission of American engineers, among which is Mr. Bean, of Dwight P. Robinson & Co., went to Italy in 1920, and studied the situation thoroughly, concluding in their report that this was an excellent investment for American capital.

ELECTRICALLY OPERATED YACHT PASSES TESTS.

Oil-Burning Engines Drive Generators That Supply Energy for Operation of Entire Ship, Including Cooking.

The tests of the big 3-masted steel auxiliary schooner *Guinevere*, built for Edgar Palmer of New York, are said to have been entirely successful. The *Guinevere* is something in the nature of an experiment, for although she is not the first she is the largest yacht yet built to be completely run by electricity. Her auxiliary power consists of two 300-hp. Winton-Diesel engines, each driving a Westinghouse generator, so that a total capacity of 500 hp. is available at the propeller shaft. The power plant that supplies the energy to drive the vessel also hoists the sails and anchor and cooks the food.

There is an extensive ammonia refrigerating plant, capable of preserving fresh meat and vegetables for a long voyage; there is a telephone in every room and a wireless outfit slung between the main and mizzen masts, and hot and cold running water is supplied by electric power.

POLE-SETTING MACHINE TO BE USED FOR LINE WORK.

An item in a recent issue of the Public Service Co. of Northern Illinois *News* tells about plans for a new pole setting machine to be used by that company. The item follows:

"The company is preparing to put into operation a pole digging and setting machine which will be installed on a 2.5-ton Master truck, with a Walker axle. This apparatus, which is in use in various parts of the country, digs a hole for a pole and sets a pole in a very short time, and thus is a saver of labor. The machinery is driven by a gasoline motor.

"A new motor generator set for charging purposes has been installed in the company's Evanston garage. It is provided with an automatic cutoff so adjusted that when the last battery is charged it cuts off the generator and shuts it down. The company's motor-driven fleet now comprises 165 vehicles. Three electric trucks have recently been added, one located at Evanston and two at Oak Park."

PERMANENT SECRETARY APPOINTED

P. E. Glenn, who has been acting secretary of the Oklahoma Corporation Commission for the past year, has assumed the duties of accountant for the commission following the appointment by the commission of G. F. Smith, of the Oklahoma City chamber of commerce, as permanent secretary. Mr. Glenn was employed by the commission as accountant which pays a larger salary than the secretaryship, but was serving in both positions temporarily for the accountant's pay until the commission saw fit to appoint a secretary.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Applications of Equipment and Methods in Practice

New Machine for Preparation of Powdered Coal.

The Pulverburner is a new machine for the preparation of powdered coal which has recently been placed on the market by the K-B Pulverizer Co., Inc., New York.

The essential features of the machine are the pulverizing mechanism and the air separating chamber.

It will be seen from Fig. 1 that the machine is fed by an automatic feeder of the belt type.

The pulverizing is accomplished by means of six rapidly revolving hinged beaters which smash the coal against breaking blocks and then against grinding plates in the bottom of the machine. The pulverulent material is discharged by centrifugal force directly into a large separating chamber. An exhaust fan, in the discharge duct leading from the separating chamber, induces air at slow velocity through the chamber, removing the fine coal and allowing the oversize to return to the machine for further pulverization. It is apparent that the velocity of the air through the separating chamber determines the fineness of the product. From the separating chamber, the fine dust is drawn through the fan and blown directly into the furnace. Secondary air is added at the nozzle. By using "splitters" the stream of coal and air can be distributed to several nozzles; thus enabling one machine to serve several furnaces.

By combining impact pulverization with air separation many advantageous features are obtained. The "fines" are removed from the machine as rapidly as produced so that the beaters are always operating on coarse material. This is an important item of power saving even though impact pulverizing is known for its low power requirements. Coal that has not been dried can be successfully handled in this type of mill and because of the air separator, there are no screens to clog.

For efficient powdered coal burning, close regulation is necessary, and this has been provided for in the Pulverburner. The rate at which the coal is fed is controlled by the automatic feeder by means of a cam arrangement that varies the speed of the belt.

The coal should be fed in such a size that a uniform "ribbon" is formed on the belt. Coal, if of 1 in. and under, is satisfactory. A magnetic pulley can be used with the feeder to prevent tramp iron from entering the machine. Quantity of air is controlled either by the speed of the fan, if a variable speed motor be used, or by a damper in the discharge passage. Air is introduced around the shaft. Velocity of the air through the separating chamber is regulated by two vanes in the chamber controlled through a worm and wheels. The beaters can be extended radially outward as they wear.

The entire controlling mechanism can be operated easily by an automatic regulator.

The apparatus is designed to be driven by either one, two or three motors. If one motor is used, both fan and feeder are driven from the pulverizer shaft. It is sometimes desirable to drive the fan from a separate motor, likewise the feeder.

The advantages claimed for the machine are its compactness, close regulation of fineness and air, simplicity, economy and adaptability to small as well as large installations. It is being built in capacities up to 3 tons per hour.

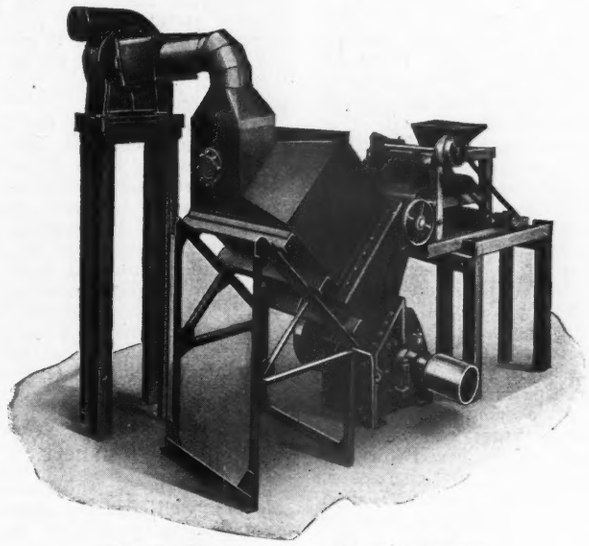


Fig. 1.—Exterior View of Pulverburner.

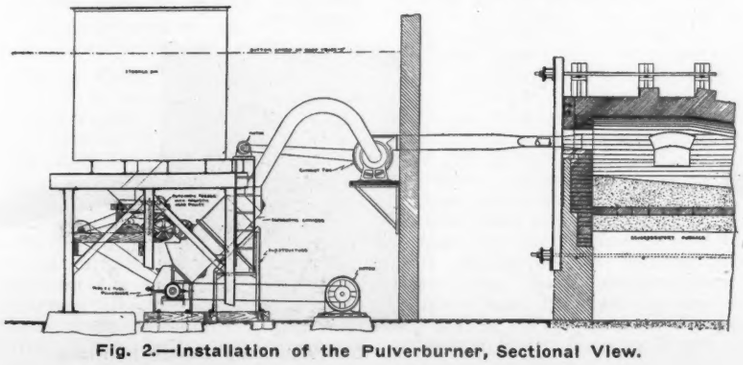


Fig. 2.—Installation of the Pulverburner, Sectional View.

New Brown Cold Junction Compensated Pyrometer.

The Brown Instrument Co., Philadelphia, has recently placed on the market a new thermoelectric pyrometer, which is automatically compensated in the instrument for changes in cold junction temperatures and which includes means of setting the pointer of the instrument to zero in the usual manner. It is stated that this is an improvement on the method of cold junction compensation developed by Darling in England in 1909, and an improvement on a few subsequent developments for automatic cold junction compensation brought out since that time. These former methods afforded no means of setting the instrument to zero. It is customary on all electrical instruments, including millivoltmeters and pyrometers, to supply a zero adjustor to enable the user to set the instrument to zero, provided the zero has shifted, due to jars in transportation or with continual service. The Brown method is claimed to be the only one which embodies this most necessary feature.

Darling used what is called a Briguet spiral, a compound strip of two metals of different coefficient of expansion. The Briguet spiral was used to move the scale dependent on the change in atmospheric temperature surrounding the instrument, or as an alternative, this Briguet spiral was mounted to act on the springs controlling the moving element of the galvanometer. Darling's device was never used to any extent because it was evident that unless an instrument had a means of setting to zero, serious errors might result in the use of the instrument. Suppose, for example, the instrument pointer was standing at 110 deg. F., was the pointer standing at this position on the scale because the temperature surrounding the instrument was 110 deg. F., or was the temperature

surrounding the instrument only 90 deg. F. and the zero had shifted 20 deg.? Naturally no accurate temperature instruments could be secured with this element of doubt. The new Brown construction patented Dec. 28, 1920, includes a means of setting the instrument to its proper zero.

It is generally understood by all users of thermoelectric pyrometers that the millivoltage, or e. m. f., developed by a thermocouple is dependent on the difference in temperature between the hot and cold ends of a thermocouple. To secure accurate measurements of temperature, it is therefore necessary that the cold end of the thermocouple be maintained at a constant temperature, or the instrument must be compensated for the changes in temperature at the cold junction of the thermocouple. It is common practice to use what are known as extension or compensating leads, formed of material similar to the thermocouple, which will transfer the cold junction from the binding posts of the thermocouple to a distant point. Heretofore, it has been necessary to locate the cold junction at the end of the extension or compensating leads in a cold well in the ground or in a compensating box, where the temperature can be maintained constant. If the new Brown pyrometer, compensated for changes in temperature of the cold junction is used, the extension or compensating leads are brought to the meter. Changes in temperature at the end of the extension or compensating leads also take place in the meter itself, which can be compensated for this change in temperature.

There are two methods by which this compensation can be easily secured. A portion of the scale of the instrument may be mounted on thermostatic material and moved, dependent on the change in temperature of the meter and in this way automatic compensation may be secured. Only a portion of the scale is moved and an index on the other portion of the scale denotes the normal zero of the instrument. A Briguet spiral similar to that used by Darling may be mounted in the instrument, controlling the springs and moving element directly, and a second index controlled by thermostatic metal may be mounted on the scale. This index works with change in temperature exactly in relation to the movement of the pointer controlled by the Briguet spiral attached to the moving element.

In using the new Brown pyrometer compensated for cold junction changes in temperature, it is only necessary to bring the compensating or extension leads from the thermocouple to the instrument. After mounting the instrument, the instrument pointer is set by the zero adjustor to correspond with the index on the scale. If the values for a thermocouple have been determined, based on a cold junction of 75 deg. F., the index will indicate 75 deg. F., provided the instrument is subject to this surrounding temperature. If the instrument pointer does not correspond with this index, it is set accordingly. When the temperature surrounding the instrument and the cold junction of the end of the compensating leads at the instrument rises to 90 deg. F., the index automatically rises to 90 deg. F., and the Briguet spiral attached to the instrument pointer causes it to move up to 90 deg. F., automatically adjusting for the temperature of the cold junction of the thermocouple.

It will be understood that any number of thermocouples with their extension or compensating leads can be brought to the one instrument having this automatic compensation. Likewise, recording instruments can be equipped with this automatic compensation and means for setting the pointer to zero. This improvement in thermoelectric pyrometers will be appreciated by the many users of these instruments, who are confronted with the difficulty of maintaining a constant cold junction temperature.

Flexible Insulated Wire for Sign Flashers.

To meet the demand for a light, flexible and well-insulated contact wire for sign flashers the Belden Manufacturing Co. of Chicago has developed especially for this purpose an extra flexible wire insulated with two reverse wraps of varnished cambric and a braid of cotton varnished. This type of insulation is exceedingly resistant to oil, water and heat. This wire may be had with a conductor made of flexible lamp-cord construction or of rope twist No. 36 soft annealed wires. The latter construction is especially recommended for its flexibility.

Attaching Device for Portable Electrical Appliances.

The Cutler-Hammer Manufacturing Co. of Milwaukee, switch and specialty department, has reversed the usual order of things, in the design of the new No. 7859 attaching device. This is done to provide flush mounting, and make a neater looking installation than is possible where the usual receptacle is mounted on the surface.

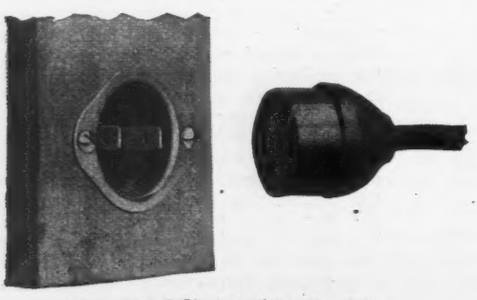
The acompanying illustrations show clearly the value of this type of attaching device on an electrically operated phonograph, for instance. The contact blades are not live except when the body is in place, and the contacts of the body are not exposed when disconnected. This device has a rating of 10 amperes, 250 volts. The diameter of the body is 1 1/16 ins.

National Multiphase Renewable Fuse.

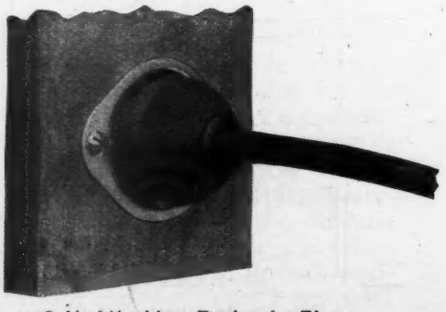
National multiphase renewable fuse, manufactured by the Federal Electric Co., Chicago, serves two purposes. First, as a fuse it is so constructed that it withstands the high starting current of motors, yet protects the running load within the limits prescribed by the Underwriters' Laboratories, Inc. It is powder-packed, which is the best known fuse practice. It has the metallic "tell-tale" indicator which shows in plain view upon the outside of the fuse the rated amperage of the element with which the fuse is loaded. As the fuse is made for operation on multiphase circuit, it acts as a circuit breaker. that is, when one fuse blows, the auxiliary device in the National multiphase renewable fuse makes one of the other elements in one of the other fuses blow, thereby breaking the circuit entirely and eliminating the possibility of the motor running as a single phase motor. This is really a time limit fuse and is absolutely fool-proof.

The two greatest causes of motor interruption, occasioning great delays, loss in production, and the costly rewinding of motors, are the overloading of fuses by placing two or more elements or an element of too great a capacity in the fuse case and the running of motors as single phase. It is impossible to place more than one element in the National multiphase renewable fuse. As this type of fuse assures the breaking of the circuit when one fuse blows, it means the highest protection possible to multiphase motors and circuits at only a slight additional cost over the ordinary renewable fuse. National multiphase renewable fuses are built on the correct time limit principle and after once installed do not need any attention whatsoever until they have operated, and then the interruption caused by renewing the fuse is very slight.

Godfrey Conveyor Co., Elkhart, Ind., has issued a catalog describing in detail the construction and operation of the Godfrey conveyor designed for coal handling. This conveyor has been successfully used in connection with concrete stave coal pockets. It has been repeatedly demonstrated that the saving effected by mechanically handling coal and storing it in concrete coal pockets repays the investment in a very short time. The principle of the Godfrey system is to take coal from a pit replenished from bottom dump cars, by bucket and elevate and carry it to storage bins. Catalog is profusely illustrated. Numerous diagrams elucidate each step in the operation of this equipment.



New C-H 7859 Attaching Device.



C-H Attaching Device in Place.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Bluestone Incandescent Light Co., Pittsburgh, has leased property at 409 Smithfield street for a local establishment.

Bell Electric Motor Co., Garwood, N. J., has changed hands and is now being conducted by new officers. The business will be carried on in the same location with increased facilities under the same name.

Willard Storage Battery Co., San Francisco, is having plans drawn for a 2-story building at Second and Stillman streets, estimated to cost $40,000. O'Brien Brothers, 240 Montgomery street, are the architects.

General Electric Co., Harrison, N. J., has filed plans for the construction of a 1-story lamp manufacturing factory at 19th and Springdale avenues, East Orange, N. J., estimated to cost $12,000, exclusive of equipment.

E. & G. Brooke Iron Co., Reading, Pa, has surveys under way for the erection of an aerial tramway line for the transportation of ore from its mines at French creek to the local blast furnaces. Motor-driven ore buckets will be installed, with power line construction to furnish service.

Southern Electric Manufacturing Co., P. O. Box 435, Bristol, Tenn., has leased a local building for the manufacture of electric fuses, plugs, cutouts and kindred specialties. The machinery installation will include punch presses, sensitive drill presses, bench tools, etc. William M. Nelson is general manager.

Cinemaphone Co., Los Angeles, recently organized with a capital of $1,000,000, to manufacture electrical specialties, has commissioned the Austin Co., Los Angeles, to prepare plans for a factory, comprising a machine shop, general manufacturing building, electrical laboratory, etc. Address George J. Webster, president.

International General Electric Co., 120 Broadway, New York City, has taken a contract for generating equipment for the power plant to be constructed by the Mexican Light & Power Co., Mexico City, Mex., in the Tepexio district, consisting of two 14,400-kw. generators. A contract has also been secured for a 10,000-kw. steam-turbogenerator for a power plant at Montevideo.

Whiting Corp., Harvey, Ill. (Chicago suburb), manufacturer of electric traveling cranes and foundry plants, has purchased a controlling interest in the Grindle Fuel Equipment Co., manufacturer of powdered coal plants for use in connection with malleable furnaces, annealing ovens, steam boilers, billet heating and various other types of furnaces. The Grindle Fuel Equipment Co. has moved its offices to Harvey, Ill., and will continue its business under the same name. The Whiting Corp. will manufacture all Grindle equipment. The following officers have been elected: President, B. H. Whiting; secretary-treasurer, T. S. Hammond; vice-president and general manager, A. J. Grindle; board of directors, J. H. Whiting, B. H. Whiting, T. S. Hammond, A. J. Grindle, R. H. Bourne, N. S. Lawrence and A. H. McDougall

Youngstown Sheet & Tube Co., Youngstown, O., has announced under date of Dec. 5 that it is making arrangements for the distribution of its 1922 calendar. This calendar contains 12 two-color illustrations 8 by 15 ins., each showing one of the important operations in the manufacture of iron and steel. The company states that this calendar has been very popular in the past and those desiring a copy can obtain one by sending 6 cts. in stamps to the Youngstown Sheet & Tube Co., to cover the cost of mailing.

Mueller Electric Co., 2135 Fairmount road, Cleveland, manufacturer of "Universal" battery clips, test clips, "Attacho" plugs, battery handles and battery jumpers, has announced under date of Dec. 8 that the manufacturing end of its business has grown to such an extent that the company has felt it advisable to dispose of that department of its business under which it acted as manufacturers' agent. Accordingly on Dec. 1 the Mueller Electric Co. sold the good will of this department of its business to one of its former employes, J. Ellis Black.

O'Brien Machinery Co., Philadelphia, now occupies new offices and show rooms at 113 North Third street. The company was formerly located at 119 North Third street. Its new home is a 5-story building which was recently purchased for its exclusive use. The new and increased space afforded by the building enables the company to departmentalize its business; electric motors, dynamos and generators being shown on one floor, small and moderate-sized machine tools on another, and one floor is devoted to the repair, rewinding, baking and testing of electrical equipment, etc.

Ideal Electric & Manufacturing Co., Mansfield, O., has issued bulletins Nos. 106 and 107 on "Ideal" motor-generator sets and electroplating apparatus, respectively. Bulletin No. 106 states that "Ideal" motor-generator sets are applicable to a very broad field, including battery charging, electrolytic work, telephone exchange excitation, telegraph service, exciter sets, welding, as well as a large and diversified line of testing sets. These motor-generator sets have also been furnished for conversion of a-c. to d-c. power for railways, mines, factory power circuits, motion picture studios and elevator work. Bulletin No. 107 states that "Ideal" electroplating generators have been giving satisfactory service in every phase of the electroplating industry for over 20 yrs. These machines embrace a broad range in ampere capacity and operate at 6 or 12 volts. They are used for electroplating, electrocleaning, galvanizing, extraction or refining of metals, electrotyping and for all similar electrolytic processes.

Electric Furnace Co., Alliance, O., manufacturer of Baily electric furnaces, has recently issued folder 12-B which contains illustrations of typical installations of Baily electric furnaces in various foundries in the Eastern states, Ohio valley, Michigan, Middle West, Pennsylvania region and in Canada. It is stated that the possible selling price of semifinished or finished castings must depend upon the following factors entering into the costs in a brass foundry: Fuel, labor, metal loss, crucible cost, furnace repairs, foundry rejections, which involve melting and molding costs; machine shop rejections, which add the cost of partial machining; rejections on final test, which include the entire cost of melting, molding and machining; factory and general overhead. Every one of them is influenced by the type of melting equipment which is used. Many foundries are able to quote prices to meet the competition of the present market because after careful investigation they have found it possible to materially reduce their costs by installing electric furnaces. It is claimed that every item which enters ino the cost of producing brass castings is benefited by the installation of Baily electric furnaces in the foundry.

Weller Manufacturing Co., Chicago, has issued catalog No. 35, devoted to elevating, conveying and power transmission for cement mills, stone and ore crushing plants, coal handling systems, sand and gravel washeries, fertilizer and phosphate mills, grain elevators and flour mills, cotton oil and cotton mills, sugar and glucose factories, tanneries, brickyards, glass plants, canneries, paper mills, etc. The catalog contains 650 pages, which are devoted to every kind of conveying apparatus that is needed about industries of the kind mentioned. It is, as the publishers note, as complete a volume on elevating and power transmission machinery as any yet published. For the occasional user the catalog endeavors to give such information as will enable him to consider the various types of machinery and to intelligently choose equipment suitable for his particular requirements of service and cost. The policy of this company has been to give the customer full value material combined with careful and prompt service. To assure the best and most economical assembling of machinery at the plant of the purchaser, every piece of equipment, pulley, sheave, sprocket, gear, etc., should be tested out in the shops of the manufacturer before shipment, to ascertain whether or not there is a perfect fit. The plant of the Weller Manufacturing Co. is always open to old and new customers for inspection.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

E. S. CUBBERLY has been elected secretary-treasurer of J. G. White & Co., Inc., 43 Exchange place, New York City.

BEN H. KRAY, formerly with the General Electric Co., has opened an office at 101 Park avenue, New York City, as consulting electrical engineer.

IVER HERLITZ is now with the Southern Sierras Power Co., Riverside, Cal. During the past year he was in the electrical laboratory of Union College, Schenectady, N. Y.

WALTER W. JOHNSON has left the Crete Mining Co., Hibbing, Minn., and is associated with the Pickands Mather Co., Duluth, as electrical engineer in the mining department.

PHILIP H. WARD, Philadelphia, has been elected president of the local electric club. George C. Young has been elected vice-president; William S. Eaton, secretary, and August Mandel, treasurer.

T. I. DEKLE, who has been with the Westinghouse Electric & Manufacturing Co., since 1917, has left to enter the service of the Cline Electric Manufacturing Co., Chicago, as control engineer.

C. R. ALDEN, formerly dean of the school of engineering, Institute of Technology, Detroit, has accepted the appointment of dean of the college of engineering, Ohio Northern University, Ada, O.

J. J. WHITMAN, Harrisburg, Pa., has been retained by the city council and chamber of commerce as expert in connection with lighting and heating conditions in the city, and to arrange for betterments.

GEORGE R. O. RUTHERFORD has become traffic engineer with the Southern California Telephone Co., Los Angeles. He was previously with the Pacific Telephone & Telegraph Co., Sacramento, Cal.

LOUIS E. MCCOY has been made assistant superintendent of the North Shore Power Co. at Three Rivers, Que. Until recently he was engineer draftsman with the Shawinigan Engineering Co., Ltd., Montreal, Canada.

ALEXANDER D. ROBB, superintendent of the Canadian Niagara Power Co., Toronto, Ont., has been appointed general manager of the company and assistant to the president, Paul A. Schoellkopf, Niagara Falls (N. Y.) Power Co.

RUFUS G. GENTRY, assistant commercial manager of The Denver (Colo.) Gas & Electric Light Co., was re-elected treasurer of the Colorado Manufacturers' Association at its recent annual convention in Canon City, Colo. In addition to his duties in that organization Mr. Gentry is also an active member of the Denver Civic and Commercial Association. He was one of the group of 200 business men which secured a charter of the Lion's Club and since the Denver Electrical Co-operative League was organized has served as one of the central station representatives on its advisory committee. He held the secretaryship of the board of trustees of the

Rufus G. Gentry.

Colorado Woman's College for 9 yrs. and is at the present time serving as a member of that board. Just 21 yrs. ago Mr. Gentry went to Denver from Little Rock, Ark., and became a member of the sales department of the old Denver Gas & Electric Co. Under his direction the sale of gas and electrical appliances has increased 500%, a record which stands at the head of all similar accomplishments of sales in that city. According to the Denver *Commercial*, "Mr. Gentry is one of those men who is endowed with the rare vision of things pertaining to civic affairs and is always ready to render his services in the unceasing campaign of education for the development of Colorado's industries and resources. He has done much toward creating that necessary feeling of good will of the business men of the city to public utilities which the progressive central station man is always striving for."

H. A. KIMBER, formerly of the Quigley Furnace Specialties Co., is now in charge of the Quigley pulverized fuel department of the Hardinge Co., 120 Broadway, New York. This change was made owing to the Hardinge Co. having acquired the pulverizing fuel department of the Quigley Furnace Specialties Co.

O. Q. HINDS has announced that he has severed his connection with the Anderson Electric & Equipment Co., effective Dec. 1, having disposed of his interest in that company. He has joined with B. J. Grigsby, O. E. Grigsby and W. C. Grunow (formerly controlling the above company), in forming a new company, known as the Grigsby-Grunow-Hinds Co., 906 West Lake street, Chicago, for the manufacture of a line of auto accessories, which it is expected will be on the market early in 1922.

F. V. ARMISTEAD, who has been located in the Schenectady (N. Y.) office of the General Electric Co., was recently transferred to the Charleston (W. Va.) office, for sales work and engineering service in that vicinity.

L. W. MARSO, in charge of the branch office of the Quigley Furnace Specialties Co., located at 427 Oliver building, Pittsburgh, Pa., has not become associated with the Hardinge Co., 120 Broadway, New York, and will continue in the Pittsburgh office under the name of the Hardinge Co., but will specialize in the handling of the Quigley pulverized fuel systems, which department has been acquired by the Hardinge Co.

OBITUARY.

FREDERICK A. KEYES, manager of the electric wire and wire rope sales department of the American Steel & Wire Co., with territory in New York state, died in Westfield, N. J., Nov. 26. He was 56 yrs. old and was formerly connected with the Worcester (Mass.) district of the company.

LEON H. SCHERCK died at his home in Poughkeepsie, N. Y. He was born in New Orleans, La., in 1875, receiving his education at Tulane University, from which he received the degree of mechanical engineer in 1896. He started to work with the Louisiana Electric Light Co., which was afterwards absorbed by other companies. In 1903 he left New Orleans for New York, later becoming connected with the Central Hudson Gas & Electric Co. of Poughkeepsie, with which he remained until the time of his death.

CHARLES R. CROSS, professor emeritus of physics of the Massachusetts Institute of Technology and a charter member of the American Institute of Electrical Engineers, died recently in Brookline, Mass. Prof. Cross was born in Troy, N. Y., in 1848, and was graduated from the Massachusetts Institute of Technology in 1870. The next year he became an assistant in physics in that institute, with which he has been connected ever since, being appointed professor of physics, then director of the Rogers Laboratory, and finally retiring a few years ago with the title of professor emeritus. It was largely due to his foresight and recognition of the increasing importance of electricity in modern life that the Massachusetts Institute of Technology offered the first degree given in an electrical engineering course in the United States. He was an authority on sound, and aided greatly in the development of the telephone. Many contributions from him have been published, including the article of "Telephony" in the Encyclopedia Britannica.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Sanford, Me. — Considerable electrical equipment will be installed in the 5-story mill addition to be erected at the plant of the Goodall Worsted Co., estimated to cost $100,000. Work will be commenced at once.

South Brewer, Me.—Brastow & Son, operating a local flour mill, have perfected plans for complete electrification of the plant. Power will be furnished by the Eastern Mfg. Co., which has acquired the water rights heretofore used for the hydraulic operation of the mill, and which will be employed for hydroelectric power generation.

Cambridge, Mass.—Department of Public Utilities has denied the application of the Cambridge Electric Light Co. for authority to increase the annual charge for furnishing service for 234 electric lamps along the Charles river parkway, now under the control of the Metropolitan District Commission, from $19.00 to $28.74.

Hartford, Conn.—Stanislaus Electric Power Co. has filed notice of dissolution under state laws.

Buffalo, N. Y.—Board of Supervisors is considering installation of a power plant for heating and other utility at the county jail and neighboring buildings, located on the block bounded by Eagle street, Delaware avenue and the Terrace. Recommendations for the installation have been made by William F. Waldow, sheriff.

Mt. Vernon, N. Y.—Considerable electrical equipment and power apparatus will be installed in the 5-story dairy plant, to be constructed by the Willow Brook Dairy Co., 5 South Fulton street, on Washington street near Columbus avenue. It will cost about $250,000. Work will be placed under way at once.

New York, N. Y.—New York Edison Co., Irving place and Fifteenth street, has disposed of a bond issue of $30,000,000, the proceeds to be used for additions to working capital, general operations, extensions, etc.

Atlantic City, N. J.—Considerable electrical equipment and power apparatus will be installed in the addition to be constructed by the Hotel Shelburne Co., estimated to cost $1,000,000. Work will be commenced at an early date.

Bradford, Pa.—The proposition to construct and operate a municipal electric power plant has been defeated by vote of citizens, averaging 15 to 1.

Pittsburgh, Pa.—West Penn Power Co., a subsidiary of the West Penn Railways Co., has acquired the plant and property of the West Virginia & Maryland Power Co., Kingwood, W. Va., recently organized to operate in the vicinity of Grafton, W. Va. The power plant at the last noted place will be improved and connected with the power transmission system now being constructed by the West Penn Co through the Cheat river district to Tunnellton, Rowlesburg, Newburg, and vicinity, as well as a power line to be built from Grafton to Riversville, on the Monongahela river, near Fairmont.

Pittsburgh, Pa.—Clarion River Power Co., Foxburg, Pa., has withdrawn the protest filed with the Public Service Commission against the proposed operations of the West Penn Power Co., Pittsburgh, in neighboring territory, and the later company will proceed with the expansion. The Clarion company is now building a hydroelectric generating plant on the Clarion river, near Foxburg.

Scranton, Pa.—Improvements of the power plant and lighting system will cost $1,000,000. A generating plant will be added on North Washington street and installation of a 20,000-kw. turbogenerator with auxiliary operating machinery will be included. Address the manager of plant.

Uniontown, Pa.—West Penn Power Co., Pittsburgh, Pa., has made application to the West Virginia Public Service Commission for permission to construct a number of transmission and distributing lines in the Union district, Monongahela county and other sections. The extensions will include Kingswood, Rowlesburg and Grafton. Arrangements are being perfected for the purchase of an existing power plant at the latter location for service in this district.

Baltimore, Md. — Public Service Commission is making an inspection of the lines and property of the Consolidated Gas, Electric Light & Power Co., in connection with the application of the company for a permanent rate increase for light and power service.

Hagerstown, Md.—Bids will be received in the spring for erection of a $300,000 power plant. Address C. E. Davis, clerk.

Havre de Grace, Md.—Havre de Grace Electric Co. is arranging to resume operations at its local power plant, which has been closed for about two years past, during which time the utility has been purchasing electric power from the United States Public Health Service Hospital power plant at Perry Point. The Government will discontinue the service.

Washington, D. C.—Application has been filed with the Interstate Commerce Commission for permission to merge the Cumberland Telephone & Telegraph Co., Cumberland, Md.; East Tennessee Telephone Co. of Virginia; the Chesapeake & Potomac Telephone Co.; and the Bristol Telephone Co., in a new company to be known as the Consolidated Telephone Co.

Hillsville, Va.—Skaggs Brothers, Burnsville, N. C., will establish a hydroelectrical generating plant in the vicinity of Hillsville. A 200-ft. dam will be constructed.

Newport News, Va.—Electrical equipment, ventilating apparatus, power equipment, etc., will be installed in the 3-story and basement high school to be erected by the Board of Education, George L. Palmer, 2711 Washington avenue, estimated to cost $400,000. Charles M. Robinson, Times-Dispatch building, Richmond, Va., is architect.

Norfolk, Va.—Electric motors and industrial electrical equipment will be installed in the 1 and 2-story cold storage plants to be constructed by J. S. Bell, Jr., Queen street, on Chapel street, estimated to cost $25,000. Work will be commenced at once.

Clarksburg, W. Va.—Monongahela Power & Railway Co. has disposed of its coal properties in the Fairmont, W. Va., field, comprising about 300 acres of land, to the Consolidation Coal Co., Cumberland, Md., for a consideration close to $2,600,000. The company will discontinue its coal operations entirely, and in the future will devote activities to the lighting, power and traction business at Clarksburg, Fairmount, and vicinity. A portion of the proceeds of the sale of the coal properties will be used for extensions in its power plants and system. The company was formerly known as the Monongahela Valley Traction Co. George M. Alexander is president.

Fairmont, W. Va.—Brooks Electric Co., recently organized as a subsidiary of the West Penn Power Co., Pittsburgh, is planning construction of power lines in Monongahela County. A franchise has been asked. The company will operate in close co-operation with the West Virginia Power & Transmission Co., another subsidiary of the West Penn Co. It is said that power for the new lines will be secured from the company's generating plant at Connellsville, Pa.

Grafton, W. Va.—Local business interests have formed the Tygarts Valley Traction Co., with a capital of $50,000, to take over and operate the property of the Grafton Traction Co. A number of extensions and improvements in electrical system and other operating branches will be made. It is proposed to resume operations at an early date.

Huntington, W. Va.—Mary Elizabeth Coal Co., First National Bank building, is planning the installation of electrical equipment and mining machinery at its properties at McGraws, W. Va. H. L. Cox is vice-president.

Huntington, W. Va.—Electric motors and other industrial electrical equipment will be installed at the local plant of the American Car & Foundry

Co. in connection with general expansion plans to cost $200,000. Headquarters of the company are at 165 Broadway, New York City.

Iaeger, W. Va.—United Light & Power Co. has arranged for the purchase of power from the Kentucky & West Virginia Power Co., Logan, W. Va., and has awarded a contract to the West Virginia Engineering Co., Williamson, W. Va., for construction of a transmission line and a number of other system improvements, estimated to cost $25,000. E. C. Birge is engineer for the United Co.

Morgantown, W. Va.—Virginia Utilities Co. is planning the rebuilding of its local compressor plant, recently destroyed by fire with loss of about $100,000, including machinery.

Richwood, W. Va.—Cherry River Paper Co. has commissioned J. H. Wallace & Co., 5 Beekman street, New York City, engineers, to prepare plans and handle the details of the erection of its proposed electric power plant, for general mill operations, estimated to cost $250,000.

Tunnelton, W. Va.—West Virginia & Maryland Power Co. is perfecting details for construction of a large hydroelectric generating plant on the Cheat river, near Albrightsville, W. Va., for light and power service throughout the entire district. The company has recently purchased existing power plants at Tunnelton and Newburg, and is now negotiating for the acquisition of the municipal electric plant at Oakland, Md., recently constructed at a cost of $50,000.

Biltmore, N. C.—The town council is planning the operation of a municipal electric lighting system. Address F. W. Kenny, town clerk.

Goldsboro, N. C.—Board of Directors, State Hospital for the Insane, has awarded a contract to the C. V. York Construction Co., Raleigh, N. C., for construction of a power house at the institution.

Pilot Mountain, N. C.—Citizens have approved a bond issue of $40,000 for installation of an electric lighting system. Address J. F. Kirkman, mayor.

Wilson, N. C.—Electric motors, ventilating, power and other equipment will be installed in the 2-story and basement high school to be constructed by the Board of Education, C. L. Coones, superintendent, estimated to cost $250,000.

Atlanta, Ga.—Fulton Bag & Cotton Mill Co. has plans under way for construction of a 1-story power house for general mill service. J. E. Sirrine & Co., Greenville, S. C., are engineers.

Columbus, Ga.—Benjamin H. Hardaway has made application to the Federal Power Commission for a preliminary permit to construct a dam and power house in the Choctawhatchee river just above Geneva, Ala. The proposed dam will be about 40 ft. high and will back water to the tailrace of the proposed installation of the city of Dothan, about 10 mi. upstream, for public utility purposes.

Miami, Fla.—The city council is planning installation of a street-lighting system on the Ocean Drive, from First street to Biscayne street.

NORTH CENTRAL STATES.

Columbus, Ohio.—Considerable electrical equipment will be installed in the 2-story addition to be erected to the woodworking plant of W. L. Lillie Co., Sycamore street, estimated to cost $100,000.

Marion, O.—Carmody Engineering Co. has been awarded the contract for construction work in West Virginia, which will cost approximately $1,000,000, and take about 5 yrs. to complete. The contract consists of construction work in Parkersburg, Clarksburg and Fairmount, W. Va., and will include electric railway extensions, reconstruction of a power plant, etc.

Big Rapids, Mich.—The city commission has asked the city manager to obtain estimates on the laying of conduits in the street for boulevard lighting. Address the city manager.

Huron, Mich.—Fire, Nov. 18, at the local headquarters of the Huron Light & Power Co., caused a loss of about $10,000.

Ludington, Mich.—Stearns Lighting & Power Co. will expend $225,000 in the next three months to modernize and completely equip its power plant. Two 1250-kw. turbine generators will be installed. Address B. E. Waltz, manager.

Muskegon, Mich.—Muskegon Light & Traction Co. has been ordered by the State Utilities Commission to continue local service. The company recently petitioned for the privilege of discontinuance.

Kokomo, Ind.—Postal Telegraph & Cable Co. will build a new line in Kokomo, making this city a relay center for new telegraph and long distance telephone offices to be opened at Marion, Logansport, Peru, Wabash, Huntington and other northern Indiana cities. Address P. J. Danihy, local manager.

Union City, Ind.—Union City Electric Co. has filed notice of increase in capital from $50,000 to $100,000.

Carmi, Ill.—Committees of business men will be appointed to ascertain the cost of posts and other equipment, together with cost of installing a new lighting system on Main and Church streets. Address chamber of commerce.

Carterville, Ill.—Carterville may be connected with the electric line proposed to be built between Carbondale and Herrin as an extension of the Murpheysboro-Carbondale interurban built a few years ago. Address A. B. Minton, president.

Galesburg, Ill.—Bids were received on Dec. 12 for construction of a lighting system, consisting of 3322 lineal ft. of single conductor No. 8 B. & S. gauge, 2500-volt steel armored lead-covered cable laid in place complete; 44 concrete foundations for poles three by three by three ft.; 44 cast iron poles, not less than 9 ft. 10 in. in height; 1 5-kw. 6.6 amperes, 60 cycles primary, 6/6 amperes secondary, series current transformer. Address Henry G. Hawkinson, board of local improvements.

Gibson City, Ill.—An election will be held Dec. 13 to vote on the question of issuing $8500 in bonds to purchase an electric pump for the water works. Address city clerk.

Hoopeston, Ill.—The contract for lighting the streets of Hoopeston expired on Nov. 1 and the matter of renewing the contract with the Central Illinois Public Service Co. will be considered. Address Mayor John A. Heaton.

Lawrenceville, Ill.—Indian Refining Co. plans the expenditure of about $1,000,000 for construction of a 6-in. pipe line from Owensboro, Ky., to Lawrenceville. Pumping station and tanks will be erected.

Rockford, Ill.—A municipal light and power company is being organized. Address Mayor J. Herman Hallstrom.

Springfield, Ill.—The municipal improvement program, recently made public, includes ornamental lighting systems and improvements in the electrical plant. Address the mayor.

Janesville, Wis.—Mayor T. E. Welsh will make a survey with Chief Charles Newman of all alleys in the downtown district to determine where additional lights are needed.

Rosholt, Wis.—E. A. Samsow, owner of the lighting plant of this village, has arranged to have a new power plant installed.

Alta, Ia.—An election will be held to vote on issuing $22,000 worth of electric light bonds. Address R. H. Wilkinson, clerk.

Muscatine, Ia.—The city is considering erection of a 1000-kw. electric plant to cost $200,000. Address W. S. Bemis, of Bemis Engineering Co., Chicago.

Oskaloosa, Ia.—Survey will be made for improving the local power plant. Address T. H. Cartin, city clerk.

Carbool, Mo.—The electric light plant will be rebuilt at an expense of $6000. Address the mayor.

Columbia, Mo.—About $40,000 will be expended to enlarge the light and water plant and install machinery. Address the mayor.

Eminence, Mo.—Western Tie & Timber Co. is having plans prepared for a hydroelectric plant. Address the manager.

Jamesport, Mo.—Bonds amounting to $24,000 have been voted for a transmission line. Address the mayor.

St. Charles, Mo.—The common council is completing plans for construction of a municipal electric light and power plant. Benham & Mullergren, Kansas City, are engineers.

St. Louis, Mo.—Considerable industrial electrical equipment will be installed in the 1-story car repair shop to be constructed on 21st street by the Missouri-Pacific Railroad Co., estimated to cost $125,000. Joseph E. Nelson & Sons, Arcade building, are building contractors.

Lincoln, Neb.—Bonds amounting to $300,000 have been voted for a light and water plant. Address Wm. Schroeder, commissioner.

Rising City, Neb.—Plans are being prepared for a power plant building. Address the city clerk.

SOUTH CENTRAL STATES.

Greenville, Tenn.—A lighting system will be installed by the city on Tusculum boulevard and North Main street. Address the mayor.

Mobile, Ala.—A municipal lighting plant may be established by the city. Address the mayor.

Newton, Dale County, Ala.—A. E. Killebrew has applied to the Federal Power Commission for a preliminary permit to construct a dam 80 ft. high and a power house in Choctawhatchee river at a point just above the town of Newton, for public utility purposes.

Little Rock, Ark.—The Stack Co., care of Dickinson & Watkins, Little Rock, has commenced construction of a hydroelectric generating plant on the Little Red river, estimated to cost $1,000,000. J. E. Sirrine & Co., Greenville, S. C., are engineers.

Altus, Okla.—Mayor C. C. Henry states that the present light plant is entirely inadequate.

Boley, Okla.—The common council is arranging for installation of an electric lighting system to cost $25,000.

Sulphur, Okla.—Bonds amounting to $10,000 have been voted for a "white way." Address the mayor.

Corpus Christi, Tex.—The power house electrical equipment of the Corpus Christi Railway & Light Co. was ruined by fire recently at a loss of $150,000. Address the manager.

El Paso, Tex.—Gem Electric Co. has been organized under state laws with a capital of $30,000, to operate an electric light and power system near El Paso. John Blake and August Albrecht head the company.

Fort Worth, Tex.—The city lighting department is planning installation of a "white way" street-lighting system on Seventh street, from Houston street to the Trinity river bridge. R. A. Hunter, city commissioner, is in charge.

Lubbock, Tex.—Fire, Nov. 16, destroyed a portion of the local electric power plant of the Texas Utilities Co., with loss estimated at $100,000. The plant will be rebuilt.

Moulton, Tex.—Moulton Light & Ice Co. has been incorporated with a capital of $30,000, to operate a local electric power and ice-manufacturing plant. The incorporators are Edward Boehm, F. T. Fehrenkamp and J. T. Jaeggle.

Robertson, Tex.—Water Improvement District No. 3 has plans under way for construction of an electrically operated pumping plant and relift station to cost $103,672, in connection with its irrigation project, the entire cost of which is estimated at $300,000. Walton & Arneson, San Antonio, Tex., are engineers.

Texhoma, Tex.—Bonds amounting to $50,000 have been voted for the purpose of making improvements on the city light and power plant. Address the city auditor.

Timpson, Tex.—Electric light plant bonds amounting to $30,000 have been approved by the attorney general's department. Address Mayor Bussey.

Vernon, Tex.—Electric light bonds amounting to $65,000 have been voted. Address Harry Mason, mayor.

WESTERN STATES.

Needles, Ariz.—Guy P. Mohler, P. O. Box 516, has applied to the Federal Power Commission for a preliminary permit to construct a series of dams in the Colorado river, in Mohave county, Ariz., and Clark county, Nev., beginning at the lower end of Pyramid canyon and extending to Boulder canyon, for the purpose of electrifying railroads.

Camas, Wash.—Fire in the substation of the Northwestern Electric Co. caused a loss of $75,000. Address the manager.

Portland, Ore.—Northwestern Electric Co. has applied to the Federal Power Commission for a preliminary permit to construct three separate developments on the north fork of the Lewis river, in Clarke and Cowlitz counties, Washington, as follows: Swift creek unit-dam, reservoir, and a 10-mi. canal to power house. Conduit site-power house, reservoir and dam 6 mi. below Cougar creek unit. Total development to be about 60,000 primary hp., for public utility purposes.

Perris, Cal.—Southern Sierras Power Co. has been granted a permit and will erect a 3200-hp. hydroelectric plant in Mill Creek canyon, a short distance from Forest Home.

San Francisco, Cal.—J. H. Hughes, 405 Sharon building, 55 Montgomery street, has applied to the Federal Power Commission for a preliminary permit to construct a small diversion dam, ditch and pipe line 1.5 mi. to a power house on French creek, near the north fork of Feather river in Butte county, Cal., for power manufacturing purposes.

PROPOSAL.

Washington, D. C.—Sealed bids will be opened in the office of the Treasury Department, supervising architect's department, Dec. 27, for installation of a lighting plant, wiring, etc., at the U. S. Quarantine Station, Baltimore, Md., in accordance with drawings and specifications, copies of which may be had at the office of the Custodian at Quarantine station, Baltimore, Md., or at the office of James A. Wetmore, acting supervising architect.

INCORPORATIONS.

Evansville, Ind. — Crescent City Electric Co., capital $150,000. To manufacture electrical machinery. Incorporators: R. P. Oblinger, H. E. Rasmussen, J. D. Meek and C. E. Roberts.

Worcester, Mass.—Sandberg-Sheppard Co., capital $100,000. To manufacture electrical appliances. Incorporators: Herbert V. Sheppard, Charles E. Sandberg, Gustaf Erikson and James E. Sheppard.

Avilla, Ind.—Avilla Mutual Telephone Corp., capital $15,000. Incorporators: Thomas Kilham, H. A. Ihrie and G. E. Thrapp.

Gary, Ind.—Gary Ignition Co., capital $10,000. To deal in electrical equipment. Incorporators: G. P. Burks, C. S. Hadley and T. A. Wood.

Indianapolis, Ind.—U. S. Bearing Co., capital $20,000. To manufacture bearings and other mechanical devices. Incorporators: E. E. Main, C. L. Gorton and E. D. Porter, Jr.

Buffalo, N. Y.—Buffalo Electro-Thermo Corp. Capital, $250,000. To manufacture electrical specialties. Incorporators: R. Anderson, C. T. and R. F. Penton, Ellicott square.

New York, N. Y.—The Radio Specialty Co. Capital, $10,000. To manufacture wireless equipment. Incorporators: H. Kantro, H. Gernsback and G. A. Hoffman, 100 Broadway.

Pittsburgh, Pa.—Moorhead Electric Machinery Co. Capital, $5,000. To manufacture electrical apparatus. I. R. Moorhead, 3417 Kedzie street, treasurer.

Philadelphia, Pa.—National Automatic Electric Iron Co. is being organized by Fred Kohn, Samuel and Louis H. Dworkin, to manufacture electric irons and kindred products. The company is represented by Levi & Mandel, North American bank building.

Nutley, N. J.—The S. A. V. Co. Capital, $125,000. To manufacture electrical appliances. Incorporators: Minard S. Smith, Norman K. Althouse and Ernest C. VanWinkle, 113 Myrtle avenue.

Jersey City, N. J.—Ideal Appliance Co. has filed notice of organization with headquarters at 266 Newark avenue, to manufacture and deal in electrical appliances. James Cavolosi heads the company.

Wilmington, Del.—Ford & Manion, Inc. Capital, $100,000. To manufacture electrical heaters and devices. Incorporators: Francis T. Manion, Henry R. Isaacs and Joseph J. Ford, Wilmington.

Chicago, Ill.—Quality Electric Co., 7719 Grand avenue, Elmwood Park. Capital, $10,000. To operate an electrical contracting business. Incorporators: N. E. and Walter L. Schumacher and Charles L. Williams.

New York, N. Y.—Halloway Electrical Supply Co. Capital, $20,000. To manufacture and deal in electrical equipment. Incorporators: H. A. Halloway, M. Comerford and I. Josephson, 1482 Broadway.

New York, N. Y.—Intercity Radio Telegraph Co. Capital, $1,000,000. To manufacture radio equipment. Incorporators: Thomas J. Elwell, Ira L. Fleischman and Charles H. Grasser. The company is represented by the Corporation Trust Company of America, du Pont building, Wilmington, Del.

Newark, N. J.—Herbert G. Peck, Inc. Capital, $5000. To manufacture and deal in electrical devices. Incorporators: Herbert G. Peck and Henry Durna, 786 Broad street.

Union Hill, N. J.—Atlas Electric Co., 123 Franklin street, filed notice of organization to manufacture and deal in electrical equipment. William Goodman heads the company.

Detroit, Mich.—Ray Battery Co. Capital, $1,000,000. Incorporated under Delaware laws to manufacture electric batteries and kindred equipment. Incorporators: James L. Wolcott, M. J. Holliday and Joseph S. McDowell, Detroit. The company is represented by the Corporation Trust Company of Delaware, Dover, Del.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Recent Offerings of Gold Bonds of Public Utilities.

A new issue of $10,000,000 Pacific Service Corporation of New Jersey 20-yr. secured 7% gold bonds offered last week by Drexel & Co., Bonbright & Co. and Clark, Dodge & Co., at a price of 98.75 and interest, to yield over 7.10%, has been disposed of. The proceeds of these bonds, together with cash from the treasury of the corporation, will pay $12,500,000 notes of the corporation maturing March 1, 1922; the annual interest charges being thus reduced.

The Utica Gas & Electric Co., which supplies electric light and power for Utica, Little Falls and numerous communities in the Mohawk valley, New York state, has sold $1,500,000 7% notes to the Harris Trust and Savings Bank. The notes are due Nov. 1, 1924, and were offered last week at par and interest, yielding 7%.

The Continental & Commercial Trust and Savings Bank, the Guaranty Company and Halsey, Stuart & Co. offered last week $2,000,000 Kansas City Power & Light Co. 25-yr. first and refunding 7.5% bonds at 101, yielding slightly more than 7.40%. The issue was heavily oversubscribed practically before the books were opened. The bonds are secured by the same mortgage as the $10,000,000 8% bonds marketed last February by this same banking group on an 8% basis.

Augusta-Aiken Railway & Electric Corp.

	1921.	1920.
September gross.....$	89,845	$ 107,662
Net after taxes.....	26,200	39,282
Deficit after charges.	5,723	*b,684
12 mo. gross.....	1,150,855	1,234,788
Net after taxes.....	353,545	428,396
Deficit after charges.	34,283	*36,483

*Surplus.

Chattanooga Railway & Light Co.

Light and power department:

	1921.	1920.
September gross.....$	118,842	$ 113,949
Net after taxes.....	34,956	38,011
Surplus after charges	12,720	17,263
12 mo. gross.....	1,351,095	1,284,060
Net after taxes.....	474,415	438,743
Surplus after charges	214,743	186,236

Cumberland County Power & Light Co.

	1921.	1920.
September gross.....$	278,381	$ 270,660
Net after taxes.....	63,774	96,306
Surplus after charges	4,684	40,544
12 mo. gross.....	3,252,502	3,042,103
Net after taxes.....	1,039,970	1,040,596
Surplus after charges	351,205	373,238

Fort Worth Power & Light Co.

	1921.	1920.
September gross.....$	218,038	$ 273,344
Net after taxes.....	106,890	76,060
Total income.....	107,175	76,397
Surplus after charges	90,512	59,890
12 mo. gross.....	2,766,650	2,238,119
Net after taxes.....	1,170,767	974,968
Total income.....	1,174,328	983,807
Surplus after charges	974,347	808,073
Balance after preferred dividends....	870,234	708,477

Galveston-Houston Electric Co.

	1921.	1920.
September gross.....$	299,008	$ 341,143
Net earnings.....	77,502	117,590
Surplus after charges	42,032	82,249
12 mo. gross.....	3,850,760	3,571,774
Net earnings.....	1,037,826	999,634
Surplus after charges	613,350	577,698

Tennesse Power Co.

	1921.	1920.
September gross.....$	193,393	$ 208,192
Net earnings.....	79,757	70,500
Surplus after charges	24,079	16,111
12 mo. gross.....	2,422,198	2,372,002
Net earnings.....	834,202	963,239
Surplus after charges	203,861	319,692

New Stock of Edison Co. to Be Offered to Stockholders.

The Commonwealth Edison Co., Chicago, announced last week that the $4,535,000 new stock, which the Illinois Commerce Commisison recently authorized the company to issue, will be offered to stockholders at par, $100 a share, in proportion to 8% of their holdings. The subscription privilege goes to stockholders of record Dec. 17. Payment will be due in four equal installments, Jan. 14, May 1, Aug. 1, and Nov. 1, 1922.

Offering of Indiana Power Co. Gold Bonds.

King, Hoagland & Co., Chicago, and W. C. Langley & Co., New York City, are offering a new issue of $1,100,000 Indiana Power Co. 20-yr. noncallable first lien and general mortgage, series "A," 7.5% gold bonds at 100 and accrued interest, to yield 7.5%. The proceeds of this issue are to reimburse the owners of the company for moneys expended for additions to the power plant and transmission lines. These additions will give the company approximately 50% more generating capacity with a corresponding increase in gross and net earnings. The Indiana Power Co. owns and operates a modern steam central power station, furnishing electric light and power to 34 communities in southwestern Indiana, including the city of Vincennes.

Columbia Gas & Electric Co.

Columbia Gas & Electric Co. for 12 mo. ended Oct. 31 last reports gross earnings of $14,920,116, an increase of $522,106 over the previous 12 mo. Net earnings after taxes and including miscellaneous income amounted to $9,863,999, an increase of $98,987. Surplus after fixed charges amounted to $4,514,040, a decrease of $185,938.

Alabama Power Co.

	1921.	1920.
October gross .....$	375,947	$ 394,420
Net after taxes	194,689	161,682
12 mo. gross	4,488,209	3,990,487
Net after taxes	2,329,817	2,063,750

To Issue Bonds for Erection of Indiana Hydroelectric Plant.

The Public Service Commission has granted permission to the Indiana Hydro-Electric Co., recently organized, to issue bonds for $1,250,000 and stock for $4,500,000, the proceeds to be used in part for the erection of its proposed hydroelectric generating plant on the Tippecanoe river, near Norway, Ind., estimated to cost $1,000,000. Additional plants will be established in this same vicinity at a later date. Harry Reid, president of the Interstate Public Service Co., Indianapolis, is vice-president and general manager. John A. Shafer, Indianapolis, is engineer.

Pennsylvania Edison Co.

Pennsylvania Edison Co. reports for 12 mo. ended Sept. 30, 1921:

Operating revenue.	$2,534,847	Inc. $547,037
Operating expenses, taxes and rentals	1,845,031	Inc. 271,158
Net income.....	689,816	Inc. 186,281
Other income.....	13,656	Inc. 353
Total income.....	703,472	Inc. 186,634
Interest on bonds, etc.	429,018	Inc. 10,481
Net income.....	274,453	Inc. 176,153

Note—The annual dividend of $8 per share on 7,250 shares no par value preferred stock outstanding requires $58,000.

Dividends.

	Term.	Rate.	Payable.
Alabama Pr., pfd.....	Q	$1.75	Jan. 1
Buffalo Gen. El.	Q	$2	Dec. 31
Cen. States El., pfd.....	Q	1.75%	Dec. 31
Consumers Pr., 6 pfd...	Q	1.50%	Jan. 3
Duluth Ed. Co., pfd....	Q	1.50%	Jan. 2
Elec. Stor. Bty., com..	Q	$3	Jan. 1
Elec. Stor. Bty., pfd....	Q	$2	Jan. 1
El Paso Elec. .....S.A.		$3	Jan. 9
Manhattan El. Sup., com.	Q	$1	Jan. 3
Manufacturers Lt. & Ht.	Q	$1	Jan. 14
Niagara Falls Pr., com.	Q	$1.50	Dec. 15
Niagara Falls Pr., pfd.	Q	$1.75	Jan. 16
Un. Lt. & Rys., 1st pfd.	Q	1.50%	Jan. 2
Util. Sec. Corp., pfd.....	Q	1.50%	Dec. 27
West'h'se E. & M., com.	Q	2.00%	Jan. 31
West'gh'se E. & M., pfd.	Q	2.00%	Jan. 16

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Dec. 5.	Bid Dec. 12.
Adirondack Electric Power of Glens Falls, common	6	12	12
Adirondack Electric Power of Glens Falls, preferred	6	81	83
American Gas & Electric of New York, common	..	124	126
American Gas & Electric of New York, preferred	6	42	43
American Light & Traction of New York, common	..	106	108
American Light & Traction of New York, preferred	6	81	89
American Power & Light of New York, common	4	69	69
American Public Utilities of Grand Rapids, common	6	78	79
American Power & Light of New York, preferred	..	6	6
American Public Utilities of Grand Rapids, preferred	..	15	15
American Telephone & Telegraph of New York	9	116	115½
American Water Works & Elec. of New York, common	..	6	6½
American Water Works & Elec. of New York, particip	7	16	16
American Water Works & Elec. of New York, 1st preferred	..	6	7
Appalachian Power, common	..	59	60
Appalachian Power, preferred	7	48	49
Cities Service of New York, common	+extra	220	221
Cities Service of New York, preferred	6	59	59½
Commonwealth Edison of Chicago	8	115	114½
Comm. Power, Railway & Light of Jackson, common	..	14	14
Comm. Power, Railway & Light of Jackson, preferred	6	34	34½
Federal Light & Traction of New York, common	..	9	9
Federal Light & Traction of New York, preferred	..	62	63
Northern States Power of Chicago, common	..	66	69
Northern States Power of Chicago, preferred	ex.div.7	81½	82
Pacific Gas & Electric of San Francisco, common	..	64½	66
Public Service of Northern Illinois, Chicago, common	7	80	81
Public Service of Northern Illinois, Chicago, preferred	6	81	81
Standard Gas & Electric of Chicago, common	..	14	13½
Standard Gas & Electric of Chicago, preferred	8	39	39
Tennessee Railway, Light & Power of Chattanooga, common	..	1	½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	5	4¾
Western Power of San Francisco, common	...	29	29
Western Union Telegraph of New York	..	92	92½
Industrials—			
General Electric of Schenectady	8	143	138
Westinghouse Electric & Mfg. of Pittsburgh, common	7	50	49½